THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Vol. 28 NEW YORK, JUNE, 1930 No. 6

American Electroplaters to Meet in Washington

Annual Convention of the American Electroplaters' Society Will Be Held in Washington, D. C., June 30-July 3, 1930, at the Mayflower Hotel

By A. G. PIERDON
Washington, D. C.

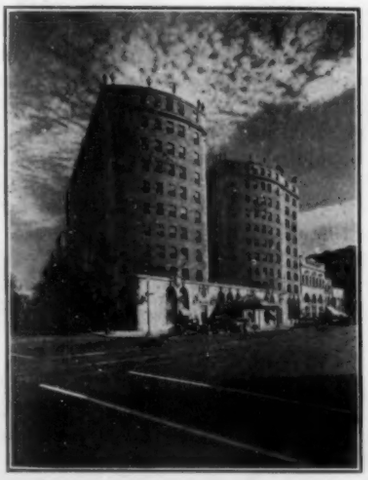
WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

WITH the coming of spring all members of the American Electroplaters' Society are casting their eyes toward Washington, D. C., while in the Nation's capital plans for the Annual Convention are being discussed by members of the Baltimore-Washington Branch. The multitudinous attractions of Washington are proving more of a barrier than a help to the Entertainment Committee who are endeavoring to plan ways and means to show our expected guests as much of our magnificent city as possible in the short time allotted.

Features of Washington

Washington is an ideal convention city, with more than 100 first class hotels, ranging from the most reasonable to the most exclusive. The Mayflower Hotel, which is to be the convention headquarters, is one of the finest and is more than adequately equipped for conventions. A very interesting feature to all those who expect to attend the convention is the cooling system which keeps the meeting room at a comfortable temperature.

To describe properly the beauties of Washington would fill a large book. The parks, the wide, well-paved streets, innumerable public buildings kept up by the pride all Washingtonians take in making their city the most beautiful in the world, make an everlasting impression on every visitor. We can truly be proud of the capital of our nation.



CONVENTION HEADQUARTERS
The Mayflower Hotel

A visitor entering Washington by train, comes into the Union Station, which is considered one of the most beautiful in America. The large plaza, with the Columbus Monument in the center, is a fitting approach to so magnificent a structure.

Looking up Delaware Avenue, one immediately recognizes the Capitol which is situated on a hill overlooking the entire city. The large well-kept grounds are a center of beauty, especially during the summer. The interior of this building is an unending source of interest to all visitors. The rotunda with its famous paintings, National Statuary Hall, the Hall of Representatives, the Senate chamber and the Supreme Court room, in fact every corridor is crowded with things of beauty and interest.

To the east of the Capitol is the Library of Congress, with its world-famous mural decorations. The originals of the Declaration of Independence and the Constitution of the United States are on exhibition here along with many etchings, engravings, and collections of rare old books of great historical interest.

To the west of the Capitol lies the Mall, the location of the new and old National Museums, Smithsonian Institute, Washington Monument, State, War and Navy Building, White House and the Lincoln Memorial. This presents a magnificent view from the steps of the Capitol.

Many pleasant hours can be spent examining the marvellous collections in the National Museum and the Smithsonian Institute. The Executive Mansion, or the White House, comes next on our route through the Mall. The East or State Reception Room, scene of many brilliant gatherings is the chief point of interest. To the north across Lafayette Square, is St. John's Church, the second oldest religious edifice in the City. One of its pews is set aside for the President, and it is sometimes called the Church of State.

To the west of the White House is the State, War and Navy Building, in which are the offices of the Secretaries of the State, War and Navy and the General Staff of

A REPORT OF THE MEETING OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION IS PUBLISHED ON PAGE 280 OF THIS ISSUE

the Army. It contains many portraits and historical objects.

The Washington Monument, which is located to the southwest of the White House, offers an opportunity for a panoramic view of the entire city and surrounding country. The interior contains memorial stones from 40

The Famous Washington Monument as it Appears from the Lincoln Memorial. Note the Beautiful Reflection in the Lagoon at the Base of the Great Shaft

states, 16 cities, 15 lodges of Free Masons, 13 of Oddfellows, 7 Sons of Temperance, 7 foreign nations and numerous other societies and organizations.

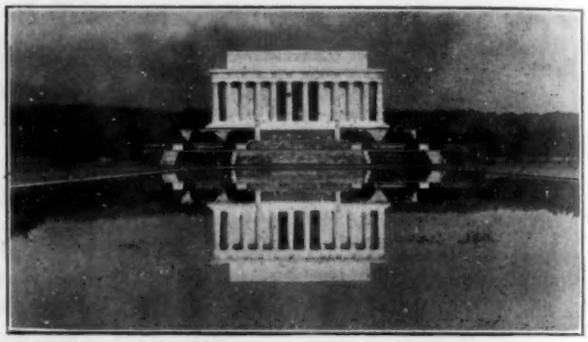
The Lincoln Memorial, which lies to the west of the Washington Monument, is isolated from all surrounding buildings. This memorial, more than any other in Washington, has the air of a sanctuary. It has the highest type of architectural beauty, possessing dignity and simplicity as well as grace. The marble statue in the central hall leaves a lasting impression on every visitor. It is Lincoln, the war president, a leader of vision and inflexible will, yet a kind, fatherly man. On each side of the central hall, screened by a row of columns, is a smaller hall. Inscribed on the wall of the south hall is the Gettysburg address, in the north hall the Second Inaugural address. Between the Memorial and the Washington Monument is a lagoon which mirrors both and also the dome of the Capitol.

The building of the Pan-American Union, not far from the Lincoln Memorial, was erected at a cost of $1,000,000 which was contributed by Andrew Carnegie and the 21 nations comprising the Pan-American Union. It ranks as one of the most beautiful buildings in the world. The approach to the building is characterized by two sunken gardens, and in the center of the interior is a typical South American patio.

The Cathedral of St. Peter and St. Paul, or the Washington Cathedral as it has come to be known, has been called by architects "the most beautiful, as we think, that the world has ever seen." The tomb of Woodrow Wilson, in the Bethlehem Chapel, has made Washington Cathedral a national shrine.

Across the Potomac river from the Lincoln Memorial is Arlington National Cemetery, the final resting place of the Nation's heroes. The tomb of the Unknown Soldier, Memorial Amphitheatre and Lee's Mansion are located here. A memorial bridge is being constructed across the river to connect the cemetery and the Lincoln Memorial.

On the Virginia shore of the Potomac River, about 15 miles below the City of Washington, is Mount Vernon, the home of George Washington. Many of his personal



The Imposing Lincoln Memorial

effects are on exhibition there. The grounds and the buildings are marvellously well kept, providing a fitting and magnificent memorial to the Father of his Country. Mount Vernon is reached by bus, trolley car or boat. Many places of beauty and historical interest are passed on the trip down the river.

A new landmark nearing completion is the Department of Commerce Building on 15th Street, south of Pennsylvania Avenue. This building will rank in size with the great office buildings and public structures of the world. It will occupy 3 full city blocks, 1,050 feet long and 325 feet wide; cover nearly 8 acres of land and include al-

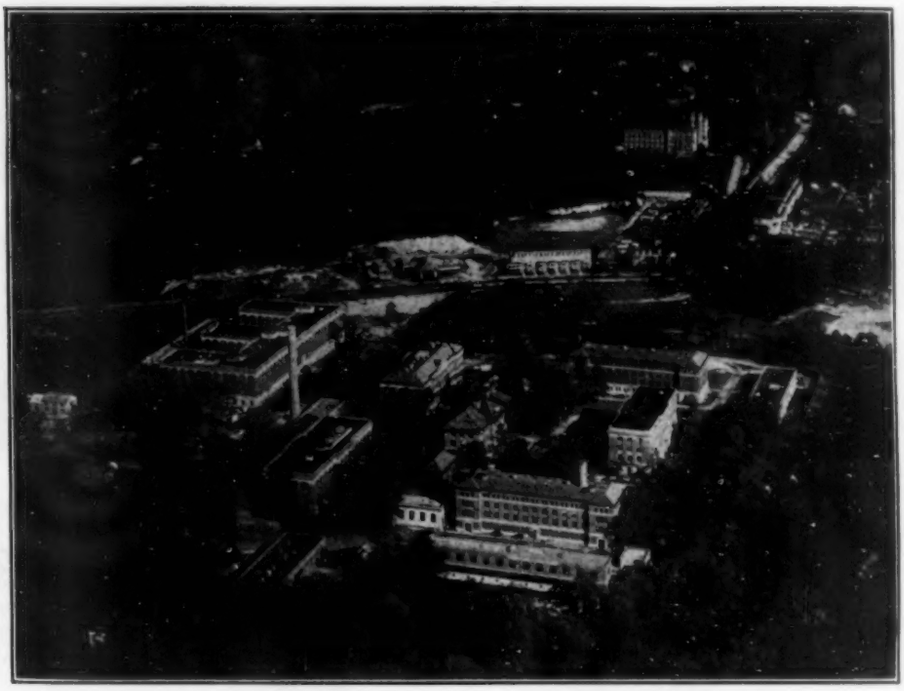
Union Station, Washington, with Its Surrounding Parks and Playgrounds

most 1,100,000 feet of floor space.

Government Electroplating Plants

The Bureau of Engraving and Printing is of special interest to all visitors as all paper currency, stamps and government bonds are printed here. The Bureau has a well equipped electrotyping department. An innovation in this art is being experimented with here, that is the electro-deposition of iron. Very soon after the deposition of chromium became commercially practical, the Bureau began to deposit chromium on the plates used in printing, as an improvement over case hardening.

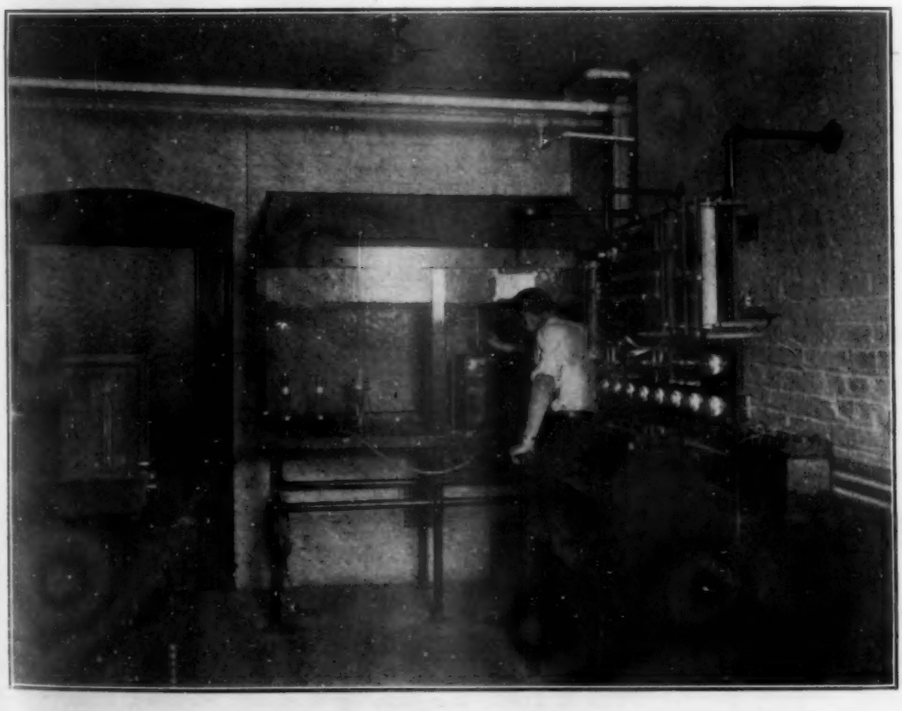
The government maintains a large and well equipped plating plant at the Washington Navy Yard. The deposition of chromium on guns and maritime instruments to resist abrasion has proved so satisfactory that this plant has been extensively enlarged to take care of the enormous increase of work. The plating department is not the only thing of interest in the Navy Yard, however, as there are many relics of the past, trophies of the exploits of the old Navy and new guns in the making for the new Navy. There is a museum containing a collection of specimens illustrating different classes of ordinance and projectiles.



An Airplane View of the Buildings which House the United States Bureau of Standards

Electroplating Research

During the past five years we of the A. E. S. have heard much from the Electro-chemical Section of the Bureau of Standards concerning the deposition of chromium. We have formed the idea that this was the only subject of research here. At this time however, the section is conducting researches on the pH control of all solutions, means of accurately analyzing silver solutions and a general research on electrotyping solutions. Dr. Blum, chief of this section, and his assistants have, for the past two years, been conducting a very interesting and instructive class for the benefit of the Baltimore-Washington branch and government employees engaged in electroplating.



View of Laboratory for Electroplating Experimentation at the Bureau of Standards

During the last three years the A. E. S. has made use of the Research Associate Plan of the Bureau of Standards by which the salaries of qualified investigators are paid by an outside organization and the facilities and supervision of the Bureau are made available. The Society has expended on research work by two Associates, about $13,000 that was collected from its Branches and manufacturers and others interested.

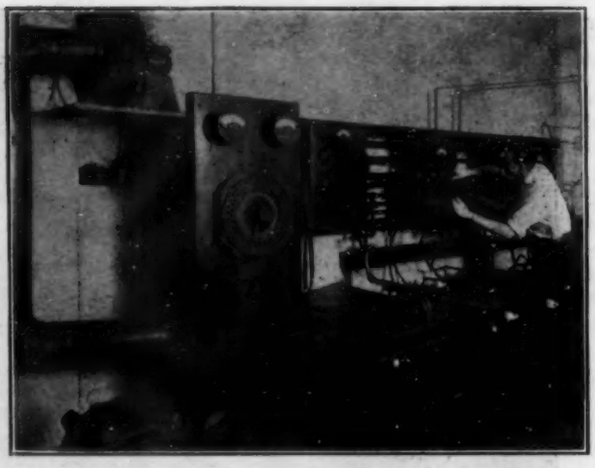
The first problem investigated was the spotting out of plated products. The results were published in detail in Bureau of Standards Circular No. 72. (See THE METAL INDUSTRY for May, 1928, pages 211-213.)

The next subject studied was chromium plating. This research has just been finished and published in Research Paper No. 131. (See THE METAL INDUSTRY for May, 1929, page 221, and the Brass World for April, 1930, page 87.)

An investigation has just been started on the protective value of plated coatings, especially chrom-

ium. Other studies are under consideration.

In order to make rapid progress it is desirable to raise $10,000 per year for three years. The Society, through its Branches, will raise $1,000 a year. It is hoped that 180 firms will invest $50 a year in this project. Those interested are urged to communicate with Philip Sievering, secretary-treasurer of the Research Committee, at 20 South Crescent, Maplewood, N. J. The chairman of this committee is R. J. O'Connor, 41 Bancroft Avenue, Bridgeport, Conn.



Small Scale Plating Plant at the Bureau of Standards

A list of the subscribers to the Fund from 1927 to 1929 follows:

Subscribers to Research Fund–1927-1929

American Electroplaters' Society Branches

BRIDGEPORT	**HARTFORD**	**NEW YORK**
CHICAGO	**INDIANAPOLIS**	**PHILADELPHIA**
CINCINNATI	**MILWAUKEE**	**ST. LOUIS**
DETROIT	**MONTREAL**	**TOLEDO**
GRAND RAPIDS	**NEWARK**	**TORONTO**

American Bosch Magneto, Springfield, Mass.
American Chain Company, Bridgeport, Conn.
American Stove Company, St. Louis, Mo.
American Zinc Institute, New York City.
Apothecaries-Hall Company, Waterbury, Conn.
Bell Telephone Laboratories, Inc., New York City.
Bommer Spring Hinge Company, Brooklyn, N. Y.
G. H. Cahoone Company, Providence, R. I.
Canada Cycle & Motor Company, Western Ontario, Canada.
Chandeysson Electric Company, St. Louis, Mo.
Cleveland Lock Company, Cleveland, Ohio.
C. J. Conn, Ltd., Elkhart, Ind.
Consolidated Iron & Steel Company, Cleveland, Ohio.
Contract Plating Company, Bridgeport, Conn.
P. & F. Corbin Company, New Britain, Conn.
Crown Name Plate & Manufacturing Company, Chicago, Ill.
Coleman Lamp Company, Wichita, Kans.
Crown Rheostat & Supply Company, Chicago, Ill.
Eastman Kodak Company, Rochester, N. Y.
Eberhardt Manufacturing Company, Cleveland, Ohio.
Egyptian Lacquer Company, New York City.
Felt & Tarrant, Chicago, Ill.
J. B. Ford Company, Wyandotte, Mich.
Gillette Safety Razor Company, Boston, Mass.
General Motors Corporation, Detroit, Michigan.
General Electric Company, Schenectady, N. Y.
Griffen Manufacturing Company, Erie, Penna.
Guide Motor Lamp Company, Cleveland, Ohio.
Hanson-Van Winkle-Munning Company, Matawan, N. J.
Hazel Atlas Glass Company, Washington, Penna.
Harshaw Chemical Company, Cleveland, Ohio.
Heerin Bros., Pittsburgh, Penna.
Hickok Manufacturing Company, Rochester, N. Y.
International Nickel Company, New York City.
Job Platers Association, Chicago, Ill.
Koken Company, St. Louis, Mo.
Landers, Frary & Clark, New Britain, Conn.
Lasalco, Inc., St. Louis, Mo.
Chas. F. L'Hommedieu & Sons, Chicago, Ill.
Lockwood Manufacturing Company, South Norwalk, Conn.
Maas & Waldstein, Newark, N. J.
Majestic Manufacturing Company, St. Louis, Mo.
Master Platers Association, New York City.
McKinney Manufacturing Company, Pittsburgh, Pa.
Meaker Company, Chicago, Ill.
Metal Industry Publishing Company, New York City.
Mueller Company, Decatur, Ill.
National Cash Register Company, Dayton, Ohio.
National Lock Company, Rockford, Ill.
National Plating Company, Milwaukee, Wis.
J. G. Nickolas Company, Chicago, Ill.
North East Electric Company, Rochester, N. Y.
Norwalk Lock Company, Norwalk, Conn.
Oneida Community Company, Oneida, N. Y.
Payson Manufacturing Company, Chicago, Ill.
Peck, Stowe & Wilcox Company, Cleveland, Ohio.
Penn Hardware Company, Reading, Penna.
Reliance Gauge Column Company, Cleveland, Ohio.
Remington Typewriter Company, Ilion, N. Y.
Roessler & Hasslacher Chemical Company, New York City.
Russell & Erwin Manufacturing Company, New Britain, Conn.
Sager Lock Company, North Chicago, Ill.
Sargent & Company, New Haven, Conn.
Schlagge Lock Company, San Francisco, Cal.
J. B. Schroeder Company, Cincinnati, Ohio.
Scovill Manufacturing Company, Waterbury, Conn.
Segal Lock Company, Brooklyn, N. Y.
A. G. Spalding Brothers, Chicopee, Mass.
Smith & Wesson Company, Springfield, Mass.
Speakman Manufacturing Company, Wilmington, Del.
C. B. Sheppard Company, Detroit, Michigan.
The Stanley Works, New Britain, Conn.
Frederick B. Stevens Company, Detroit, Mich.
Sterling Electro-Plating Company, La Porte, Ind.
Stewart-Warner Speedometer Company, Chicago, Ill.
Stromberg Motor Devices Company, Chicago, Ill.
George A. Stutz Manufacturing Company, Chicago, Ill.
Waukegan Chemical Company, Waukegan, Ill.
Western Casket Hardware Company, Elgin, Ill.
Western Clock Company, La Salle, Ill.
Westinghouse Manufacturing Company, E. Pittsburgh, Pa.
Westinghouse Products Company, Mansfield, Ohio.
Yale & Towne Manufacturing Company, Stamford, Conn.
Zouri Drawn Metal Company, Chicago Heights, Ill.

Convention Activities

The program of the convention is in the able hands of the Baltimore-Washington Branch through its various committees. The officers and committee chairmen are as follows:

President ..... T. F. Slattery
Past President ..... M. J. Kraft
Vice President ..... W. Ermlich
Secretary and Treasurer ..... I. H. Hahn
Librarian ..... Dr. W. Blum
Board of Mgrs... M. J. Kraft, A. D. Fewell, A. G. Pierdon
Chairman, Hotel Committee ..... F. F. Pierdon
Chairman, Entertainment Committee ..... T. F. Slattery
Chairman, Program Committee ..... I. H. Hahn
Chairman, Papers Committee ..... Dr. W. Blum
Chairman, Registration Committee ..... A. D. Fewell
Chairman, Ladies' Committee ..... Mrs. F. F. Pierdon
Chairman, Publicity Committee ..... A. G. Pierdon
Chairman, Exhibits Committee ..... M. G. Lassance

Entertainment Planned

The Entertainment Committee has many plans for the recreational part of the convention, which are enjoyable as well as instructive. These include a trip to Mt. Vernon, Va., by boat. This trip alone attracts many tourists to the National Capital. The steamer on its way down the river passes Potomac Park, 1,000 acres of reclaimed ground, with its golf course and beautiful flowers and trees; the War College, the highest course in Military science of the United States army; Alexandria, a typical southern colonial town abounding in places of historical interest; Jones' Point Lighthouse where George Washington set the initial cornerstone to mark the District of Columbia, April 15, 1791, and Forts Foote, Hunt and Washington.

The committee has also planned a general sightseeing trip through the city by bus. This trip takes in the Capitol; the Congressional Library, which houses the originals of the Constitution and Declaration of Independence; the White House; the Treasury; the State War and Navy Building; the Lincoln Memorial; the Washington Monument; the Corcoran Gallery of Art; the American Red Cross Building; the National Museums; the Smithsonian Institute; the Freer Gallery of Art; the Pan American Building; the Soldiers' Home; the Washington Cathedral with the tomb of Woodrow

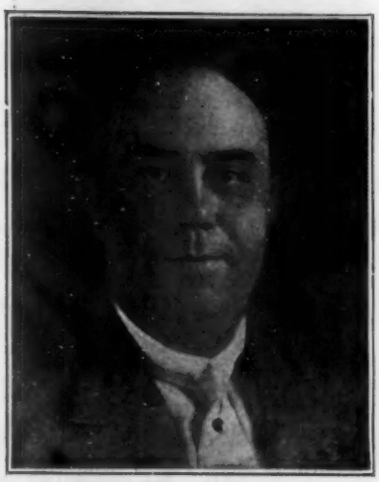
Officers of the American Electroplaters' Society

HORACE H. SMITH
Newark Branch
President

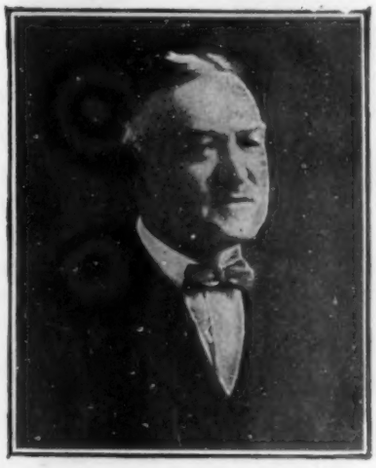
C. A. VAN DERAU
Dayton Branch
First Vice-President

W. J. R. KENNEDY
Hartford, Conn., Valley Branch
Second Vice-President

GEORGE GEHLING
Philadelphia Branch
Secretary-Treasurer



F. J. HANLON
Chicago Branch
Editor, The Monthly Review



J. H. FEELEY
Montreal Branch
Past President

Wilson, and Arlington National Cemetery with the tomb of the Unknown Soldier. There will be a trip to the Bureau of Engraving and Printing where the paper money, postage stamps and bonds are printed. Special arrangements have been made to allow those who attend the convention an opportunity to see the electrolytic department, which was one of the pioneers in the use of chromium plating to resist abrasion.

The committee has also arranged for a trip through the Navy Yard which includes in addition to the regular sightseeing tour, a trip through the gun shop and plating department. Another interesting feature is a tour of the Bureau of Standards. The Baltimore-Washington Branch has held classes here during the past two years under the supervision of Dr. Blum and his associates. The laboratory of the electro-chemical section has proved an ideal classroom.

A special program has been arranged for the ladies. This program is ample to insure them a pleasant, enjoyable and instructive visit to the nation's capital and will keep them occupied at all times.

Technical Sessions

In addition to these enjoyable features several technical sessions will be held. The papers thus far submitted have been very diversified and indicate that many interesting and lively discussions will ensue. Ample time will be provided for these discussions which are often the most valuable part of the meetings. These papers cover almost all phases of plating, including cleaning, and silver, cadmium, nickel, copper and chromium plating. One entire session will be devoted to a discussion of the education of electroplaters, which is perhaps the most important aim of the society. This discussion will be led by those who have conducted platers' classes in Newark, New York, Chicago, Philadelphia, Providence, Washington and other cities. There will then be an opportunity to consider the many problems coincident with the conducting of such classes and means of encouraging the formation of other classes and the extension and improvement of those now in existence.

The registration fee for men will be eight dollars each, and for ladies it will be six dollars each. This registration includes all trips, a picnic supper and the banquet. Children under 12 years of age will be registered free and will be taken on all trips without charge. Extra banquet tickets may be purchased at $4.00 each.

Hotel Accommodations

The Mayflower Hotel, convention headquarters, is ideally equipped for this purpose. The meeting room is automatically maintained at a constant temperature by a very efficient cooling system. The rates are very reasonable for a hotel of its reputation. Rooms with single beds are $4.00, with double beds $6.00 and with twin beds $8.00. Each room has a private bath. The hotel has arranged to place cots, suitable for children, in the rooms having twin beds, for $2.00 each. At these cots are somewhat limited in number it will be necessary to reserve them in advance.

Because of the short time allowed for the convention, the committee has arranged to provide luncheons at the hotel for $1.00 each or four for $3.50. These luncheons will be served in a dining room reserved for the convention and will be served promptly to allow ample time to enjoy each meal before the buses leave the hotel for the various trips which will occupy each afternoon.

A fine room has been provided for displaying exhibits and it is hoped that members will respond heartily to the request for exhibits of their art and ingenuity.

Transportation Arrangements

Excellent arrangements for transportation have been made. The Pennsylvania Railroad will arrange for special cars on a train, which will leave at the most convenient time to arrive in Washington for the convention. This train will pick up passengers in New York, Newark and Philadelphia, thus permitting those leaving from these points to travel together. Anyone interested can secure complete information by writing to T. A. Trumbour, care of THE METAL INDUSTRY, Box 183 Wall Street Station, New York.

International Fellowship Club

The International Fellowship Club will meet on July 1st at the Mayflower Hotel in Washington where it will hold a luncheon and meeting. Prominent men have been obtained as speakers and a worth-while program is promised.

The Club has had a very successful year, holding four

BENJAMIN POPPER
Egyptian Lacquer Manufacturing Company, New York
Chairman

G. CANNON
Matchless Metal Polish Company, Chicago, Ill.
Vice-Chairman

T. A. TRUMBOUR
The Metal Industry and the Brass World, New York
Secretary

meetings in 1929. In 1930 the annual New York luncheon was held on February 15, together with the annual banquet of the New York Branch; the Chicago luncheon was held on January 18. Both of these meetings were well attended and the guests were addressed by speakers of international reputation.

Senator Walsh to Speak

Due to very unusual arrangements as to speakers, it is expected that the luncheon at Washington will be the best attended in the history of the Club. Honorable David I. Walsh, United States Senator from Massachusetts, has accepted an invitation to address the Club at the luncheon. Senator Walsh is senior senator from his state, one of the ablest men in Congress. He was secured as speaker largely through the efforts of Frank J. Clark of Springfield, Mass., past-president of the Club.

Another important speaker at the luncheon will be Harry H. Steidle, of the Division of Trade Standards, Department of Commerce, who will talk on the activities of his Division, which handles the Government's work on commercial standards of every kind. With these excellent speakers on the program, there can be no question as to the importance of all members attending the luncheon.

Reduced Fare Certificates

It is most important that all members and guests traveling to the convention should apply for a Reduced Fare Certificate. Such certificates can be obtained at any time up to 30 minutes before the departure of the train on which the journey will be made. These certificates are not kept at all stations but at most of the important centers. It should be asked for wherever the journey is begun. If they are not on sale at that particular station, the ticket agent will advise where they can be purchased. In that case local ticket should be bought to the station which has certificates in stock, and from there a through ticket and a certificate obtained. **Be sure to ask for a certificate.** Do not ask for a receipt.

Immediately upon arriving at the meeting, the certificate should be presented to the endorsing officer, George Gehling, secretary of the American Electroplaters' Society, who will give full directions about validation of the certificates for the return journey.

There must be 150 certificates presented in order to get the benefit of the reduced fare. It is the duty of everyone going to the convention to obtain such a certificate.

General Convention Program

Eastern Standard Time

Saturday, June 28

2:00 P. M.—Registration.

Sunday, June 29

2:00 P. M.—Registration.

Monday, June 30

8:00 P. M.—Registration.
10:00 A. M.—Educational Session.
12:30 P. M.—Lunch at Mayflower Hotel.
1:30 P. M.—General Sightseeing Trip.
Notice: For this and all trips, the buses will leave from the north side of the hotel.
8:00 P. M.—Business Session.
Seating of Delegates.
Presentation of Amendments.
Report of Research Committee.

Tuesday, July 1

9:00 A. M.—Educational Session.
12:30 P. M.—Lunch at Mayflower Hotel.
1:30 P. M.—Buses leave for trip through Washington Navy Yard; and thence to Fairlawn Park, where the annual baseball game will be played and a picnic supper will be served.
7:30 P. M.—Buses leave Park for Mayflower Hotel.
8:00 P. M.—Educational Session.

Wednesday, July 2

9:00 A. M.—Educational Session.
12:30 P. M.—Lunch at Mayflower Hotel.
1:30 P. M.—Buses leave for wharf, where steamer will leave at 2:15 P. M. for Mt. Vernon. Photograph will be taken immediately after reaching Mt. Vernon.
6:30 P. M.—Arrive back at Hotel.
7:30 P. M.—Banquet.

Thursday, July 3

9:00 A. M.—Business Session.
General Business.
Election of Officers.
Selection of Next Convention City.
12:30 P. M.—Lunch at Mayflower Hotel.
1:30 P. M.—Buses leave for trip through the Bureau of Standards.
5:00 P. M.—Return to Hotel.

Educational Session

June 30, Monday—10 A.M.

Chairman—Horace H. Smith

1—The Cleaning of Metal (Illustrated with Experiments).
R. W. Mitchell, Magnus Chemical Company.
2—The Introduction of Iron Into Alkaline Cleaning and Plating Solutions.
F. J. Liscomb, Hanson-Van Winkle-Munning Company.
3—Improvements in Black Rustproof Finishes.
C. H. Proctor, Roessler & Hasslacher Chemical Company.
4—Deposition of White Cobalt-Nickel Alloys.
C. G Fink and L. K. Lah, Columbia University.
5—Oxidized Brass, Copper and Silver Finishes on Aluminum and Its Alloys.
R. E. Pettit, Aluminum Company of America.
6—Practical Lacquer Valuation from the Platers' Standpoint.
R. V. Kirk, Roxalin Flexible Lacquer Company.

July 1, Tuesday—9 A.M.

Chairman—C. E. Van Derau

7—The Buffer Properties of Nickel Plating Baths.
K. Pitschner, Firestone Steel Products Company.
8—Effects of Acids and Alkalis on the pH of Nickel Baths.
W. Lockerbie, Chicago Branch.
9—The Deposition of Nickel at a low pH.
H. C. Mougey and W. M. Phillips, General Motors Corporation.
10—Anode Rods.
G. B. Hogaboom, Hanson-Van Winkle-Munning Co.

11—Nickel Anodes. Round Table Discussion by Manufacturers and Users.

July 1, Tuesday—8 P.M.

Chairman—W. J. R. Kennedy

12—The Education of Electroplaters. Round Table Discussion led by:
O. J. Sizelove, Newark Branch.
Dr. A. K. Graham, Philadelphia Branch.
H. W. Faint, Chicago Branch.
W. Blum, Baltimore-Washington Branch.
E. K. Strachan, Providence-Attleboro Branch.
L. C. Pan, New York Branch.
C. L. Mantell, Pratt Institute.

July 2, Wednesday—9 A.M.

Chairman—George Gehling

13—Researches on Silver Plating.
E. B. Sanigar, Columbia University.
14—The Analysis of Silver Plating Solutions.
R. M. Wick, Bureau of Standards.
15—The Commercial Control of Silver Plating.
A. E. Thurber, Oneida Community.
16—Problems in Cadmium Plating.
G. Soderberg, Udylite Process Company.
17—The Titration of Cyanide in Cadmium Baths.
W. P. Barrows, Washington Navy Yard.
18—The Deposition of Zinc-Cadmium Alloys.
C. J. Wernlund, Roessler & Hasslacher Chemical Company.
19—The Deposition of Silver-Cadmium Alloys.
C. G. Fink and B. G. Gerapostalon, Columbia University.
20—The Titration of Free Cyanide in Copper Baths.
M. R. Thompson, Bureau of Standards.
21—The Bent Cathode Test as Applied to Copper Baths.
W. L. Pinner and E. M. Baker, General Spring Bumper Co.
22—The Protective Value of a Copper Strike.
W. S. Barrows, Toronto Branch.

Ladies' Program

Monday, June 30

12:30 P. M.—Lunch at Mayflower Hotel.
1:30 P. M.—Sightseeing Trip.
8:00 P. M.—Card Party.

Tuesday, July 1

10:00 A.M.—Trip through Art Galleries.
12:30 P. M.—Lunch at Mayflower Hotel.
1:30 P. M.—Trip to Navy Yard and Fairlawn Park. Picnic Supper.
8:00 P. M.—Theatre Party.

Wednesday, July 2

10:00 A. M.—Tour of Parks and Cathedrals.
12:30 P. M.—Lunch at Mayflower Hotel.
1:30 P. M.—Trip to Mt. Vernon.
7:30 P. M.—Banquet.

Thursday, July 3

10:00 A. M.—Shopping Tour.
12:30 P. M.—Lunch at Mayflower Hotel.
1:30 P. M.—Trip to Bureau of Standards.

Thanks From the American Electroplaters' Society

To THE METAL INDUSTRY:

As chairman of the Membership Committee of the American Electroplaters' Society, I wish to express my appreciation for the unusual co-operation you have given me in working out our advertisements for THE METAL INDUSTRY and Brass World. I am certain that the whole membership of the Society, which constitutes the Membership Committee, feel as I do, that we are indebted to you.

Your aid in giving us such excellent publicity has greatly strengthened the Society by awakening a greater interest in the electroplating industry, quickening the membership as a whole to the possibilities of a greater educational program and—what was the most important goal—increasing the membership.

I am glad to show you this deserved recognition of your efforts to be of service to the electroplating industry.

GEORGE B. HOGABOOM,
Chairman, Membership Committee,
American Electroplaters' Society.

New Aluminum Research Laboratory

The Aluminum Company of America, Pittsburgh, Pa., on May 20 opened a new research laboratory which is undoubtedly one of the most important of its kind in the world today. The laboratory grounds are several acres in area, while the building itself, U-shaped, covers a piece of ground 270 by 110 feet. In general, it is a two-story building, but the exigencies of its purpose are such that some very important parts of the work it will do require the basement, while the part of the first floor extends into the second, to provide more headroom. Pittsburgh's best known architect, Henry Hornbostel, designed the building, and, naturally, it has been built in part as a perfect working demonstration of the uses to which aluminum and its alloys are being put in the construction and maintenance of buildings. There are aluminum gates, doors, window frames, ornamental grilles, spandrels, cornices and other decorations. Inside, aluminum furniture and fittings, including such items as lockers, hatracks, desks, tables, chairs, etc., are used.

The entire water cooling system is aluminum-piped and fitted, as are the steam, sewer and other pipe systems. The chemical laboratories are largely equipped with aluminum. Besides the new laboratory at Pittsburgh, the Aluminum Company of America has seventeen other laboratories, located at its various plants and subsidiaries. These are responsible to the main laboratory for methods only. They do their own work in research, analysis, control, etc.

Instances of its excellence in equipment, to mention only a few, include an all-aluminum crane of three-ton rated capacity but equal to the strain of five tons, actually. A compression-tension testing machine was shown which can take pieces of the metal eleven feet long in compression and ten feet in tension tests—to be used for testing girders and other large aluminum pieces. A great many machines have been designed for taking such tests as the effect of vibration, bending, torsion, etc., which can give up to five million cycles. A variety of special temperature equipment—furnaces, ovens, melting pots, etc.—provide for lines of work requiring heat ranging from 112° below zero to 1,500° above zero, Fahrenheit. Of course, complete apparatus for measuring, observing and examining the metals have been provided. These include X-ray rooms, metallographic machines, cameras, and the many other pieces of apparatus used in connection with these.

Evolution in Automobile Finishes

Progress in Developing Metal Finishes to Keep Up with the Trend of Automobiles—Conclusion*

By M. J. CALLAHAN

Chemical Superintendent, Chemical Products Division, E. I. du Pont de Nemours and Company, Parlin, N. J.

A PAPER READ AT THE MEETING OF THE AMERICAN SOCIETY FOR TESTING MATERIALS, DETROIT, MARCH 19, 1930

Salient Changes in Lacquers

No discussion of the evolution of body finishes would be complete without some reference to the changes that have occurred in lacquers themselves. Lacquers as originally produced gave finishes of so-called egg shell gloss. Improvements in methods of dispersing pigments coupled with better spraying and polishing methods in the factories served to overcome this original defect, and at the present time the luster of a properly finished body, while not similar to that obtained with clear body finishing varnish, is entirely satisfactory. Recently the adoption in the body finishing plants of mechanical methods of polishing has served to improve still further the brilliancy and luster of the final finish, while at the same time reducing costs as well as physical labor.

In the earlier phases of use some difficulty was encountered in obtaining maroon shades of satisfactory durability. Cooperative efforts of the lacquer chemists and synthetic color chemists resulted in a solution of this problem, and satisfactory maroon lacquers have been available for some years.

The lacquer chemist is still giving thought and study to the improvement of the body finish. Mention has been made of the surface disintegration that occurs during service. This is particularly severe under conditions of high ultra violet light intensity and moisture such as are encountered in the tropics. It results in the formation of a deposit or "chalk" on the surface of the film which is actually pigment either washed out of the binding medium or deposited as a result of disintegration of the binder. A careful study of this problem has shown that it is specific for certain pigments, and that by careful selection and combination of such pigments "chalking" can be reduced to a degree that represents marked improvement over products formerly used.

Contemporary Evolution in Chemical Fields

The effect of the adoption of lacquers for automobile body finishing in the fields of synthetic organic liquids is of interest. In 1923 at the time of adoption of lacquers, butyl alcohol, butyl acetate, ethyl acetate, ethyl alcohol, xylol and toluol comprised the most used solvents and diluents in the lacquer field. Reference to Table II indicates the possibilities that now exist in the selection of solvents and diluents for lacquer formulation, and clearly indicates the stimulation in research in this field that has been a direct result of the evolution in body finish. As indicated, secondary butyl acetate prepared from gases from oil cracking stills, synthetic amyl alcohol and acetate synthesized from casing head gas, the acetic ester of the monoethyl ether of ethylene glycol (cellosolve acetate) prepared from ethylene, as well as the propionic ester of butyl alcohol bear witness to the activity of the chemical manufacturers in this field.

TABLE II.—COMPARISON OF SOLVENTS COMMERCIALLY AVAILABLE IN 1923 AND IN 1930

1923	
Ethyl acetate	Butyl acetate
Acetone	Amyl acetate (fermentation)
1930	
Ethyl acetate	Butyl acetate
Acetone	Secondary butyl acetate
Iso propyl acetate	Butyl propionate
——	Amyl acetate (synthetic)
Monoethyl ether ethylene glycol (cellosolve)	
Monoethyl ether ethylene glycol acetate (cellosolve acetate)	
Monomethyl ether ethylene glycol (methyl cellosolve)	
Ethyl lactate	

Note.—Alcohols corresponding to the esters are also available.

The diluent portion of a lacquer formulation is an important part of the composition since it is largely responsible for obtaining a proper spraying or atomizing viscosity at a minimum cost. The extensive use of lacquers over the past few years has threatened to bring about a shortage in toluol, and it has been found practical to substitute certain petroleum fractions of equivalent evaporation rate. The petroleum fractions, of the aliphatic type, show a greater precipitating power when added to a cellulose nitrate solution than the corresponding aromatic bodies for which they are substituted. Fractions from crude oils containing naphthenes are best suited as lacquer diluents, but are more difficult to obtain due to their value as an anti-knock agent in motor gasolines. Table III gives some comparative physical data on a number of gasoline fractions now available for lacquer formulations. During the past year ethyl benzene has been offered for sale in small amounts. This material shows many of the characteristics of xylol and could be used as a substitute for it.

TABLE III.—PHYSICAL CONSTANTS OF HYDROCARBON FRACTIONS FOR LACQUER USE

Diluent	Specific Gravity	Boiling Range Deg. Cent.	Precipitation Factor[a]
Toluol	0.8660	109 to 110	10
Fraction (Atlantic Coast)	0.734	92 to 135	5
Fraction (Pacific Coast)	0.769	87 to 135	8
Ethyl Benzene	0.868	119 to 148	9
Xylol	0.863	132 to 145	9+

[a] Arbitrary factor, toluol as 10.

In passing it is well to mention that lacquers have also been adapted for various methods of application other than by the spray gun. An early development following closely after their introduction into body finishing, and as a natural aftermath of the rapid speeding up of production cycles, was for striping purposes. At first only narrow stripes could be handled, but later it was found possible to modify compositions and produce products capable of brushing in board bands, and satisfactory for use in the more modern mechanical striping pens and guns. There have been several attempts to adapt lacquers for application by flowing. Products which will handle successfully under these conditions have been produced, but the process apparently is uneconomic, and the limitations imposed on body design are such as to render its adoption unlikely.

* Part 1 was published in our issue of May, 1930, pages 227-9.

Undercoats for Body Finishes

While very radical and revolutionary changes in the use of color coast for body finishes for automobiles were taking place, it is only within the past year that any really new products have found a place as undercoats. When lacquer was first introduced, it was found that it could be applied over baked undercoats based on oleoresinous varnishes, and a finish of satisfactory appearance, adhesion, and service durability obtained. Some modifications of these earlier used undercoats, along the lines of different pigmentation and more rapid drying were worked out, but in general no important changes occurred. The baked oil type undercoats were satisfactory because of their ease of application, low cost, and satisfactory service. Undercoats using cellulose nitrate as a base were developed in an effort to utilize the quick drying characteristics obtained with lacquer. They have been entirely satisfactory from a performance standpoint as their use on a large number of automobiles during the past few years indicates, but they have never supplanted the older type of undercoat due to their higher cost which overbalanced whatever economy was possible as a result of their more rapid drying.

Within the past year, the finish chemist has developed new undercoats which may supplant the older types. These undercoats are based on synthetic resins, produced by the interaction of polyhydric alcohols and mono and dibasic acids. These resins known as glyptals were first commercially developed in the laboratories of the General Electric Co. and adapted for undercoats by the duPont Co. The valuable property of these resins is their ability to harden rapidly at low temperatures. This is in contradistinction to the older type of undercoat, where hardening or drying was an oxidation reaction requiring a longer time interval. Utilization of this quick drying property has made it possible to apply primer, putty, and surfacer coats, with only a short air drying time interval between operations, and to bake this completely applied undercoat in one operation. Systems of this type have been in successful use in body plants for the past year. The possibility of economies, particularly in case of necessity of further expansion of production with present facilities, are large, and full advantage will undoubtedly be taken of this factor in the future.

Fender Finishes

Contrary to all other parts of the automobile, the finish on fenders has remained static. It is a curious reflection that just prior to the introduction of lacquer, the quality of the finish on fenders was considered so satisfactory as to be an objective to be equalled by any new product produced by workers in the field of finishes. With the introduction of lacquer finishes on bodies, followed by the use of chromium plating for exposed metal parts, and with no improvement in the durability of fender finishes they have become, to quote conversely "and the first shall be last." At the present time fender finishes lose their brilliancy and luster after only a few months' exposure, and from then on are entirely out of harmony as regards appearance with the rest of the automobile. There have been advances in production methods resulting in shorter time schedules in finishing, but these changes have brought no improvement in the life of the finish under service conditions. The activities of the research worker in finishes can well be focussed on this problem.

Engine and Accessory Finishes

Little need be said regarding evolution in finishes for engine parts and accessories. Advantage of the use of lacquers has been taken wherever economically possible. It can be said in general that finishes in this field have kept well abreast of modern finishing methods and materials.

Further Evolution

No discussion of the evolution of automobile finishes would be complete without some attempt to forecast the future trend. The present lacquer finish for automobile bodies appears to be thoroughly practical. It is easy to apply and adaptable to changes in body design. In general it is satisfactory to the car owner. Its cost to the automobile manufacturer has decreased steadily over the period of the past ten years. At present there is no product in sight which appears to have a reasonable chance of supplanting the present-day lacquer. However, research in the field of synthetic colloids is being carried on intensively by a number of prominent industrial concerns, and it is not unlikely that a product of properties equivalent to present-day cellulose nitrate lacquers, but based on a new type of colloid, may be produced. If an economic advantage can be obtained a substitution undoubtedly will occur. The field of corrosion-resisting alloys offers considerable interest, and it is not too radical perhaps to speculate that alloys may be produced which will allow of the manufacture of automobile bodies which will require no finishing other than a burnishing operation.

Without question an improvement in finishing materials for fender finishes will result shortly. It is inconceivable that the finishes industry, which has solved the other problems of automobile finishing, will fail to make an improvement in this field.

Of great future significance is the widespread interest in the finishes industry in the technology of finish raw materials and methods of manufacture. The numerous references in the technical literature to new discoveries and advances in the field bear witness to this. An alert and vigilant industry is an almost certain sign of continued evolution in automobile finishes.

Spongy Castings

Q.—We have trouble with our drawer pull tarnishing after they are finished. On examining the enclosed sample, you will see the spots. This pull has not been in any acid or water-milled. It was tumbled dry, polished, buffed, colored and dipped in hot water to take the tripoli off. It seems the metal is rather spongy. The pull was made of Lake copper and virgin zinc. Can you give us a remedy for this?

A.—Examination of sample with a magnifying glass shows the casting is very porous. It has the appearance of containing aluminum, used as a flux. Your remedy is to overcome this spongy condition and we suggest you use a mixture of 65 copper, 32 zinc, and 3 lead and not over 2 ounces of aluminum to the hundred pounds. If the casting runs without loss, do not use any aluminum. Also, use your sand as dry as is consistent with good molding practice. Look after your melting practice. If crucibles are used, melt the copper first under charcoal, then add the lead, then the zinc, and stir well; just before pouring, add a teaspoonful of salt to the metal.

Take a glass and look at the casting when poured and we think you will find your trouble overcome. There is no other remedy but to overcome this spongy condition.

W. J. Reardon.

Constant Growth Marks History of Sievering Plating Plant

Oldest Jobbing Plant in New York Adds 10,000 Square Feet of Space—New 5000 Ampere Generator for Chromium Installed—May Put in Automatic Conveyor Later

THE job electroplating plant of Philip Sievering, Inc., at 199 Lafayette Street, New York City, already one of the largest and best equipped in that city,—or, for that matter, in the United States—has further expanded by the addition of another floor of the same building. This gives the firm ten thousand square feet of additional space, or a total of 30,000 sq. ft. to take care of a business that has grown steadily during the forty years of its existence.

Founded in 1889 by Philip Sievering, who still actively heads it, the firm began at 222 Center Street and stayed there for about a year. It was a small place, with one nickel and one silver tank, and when Mr. Sievering changed his address he went into partnership with A. Weck, under the style of A. Weck and Sievering, at 209 Center Street. These addresses are not very far from the company's present location. After five years at 209, the subways were put through the district and this made it necessary for the building to be rebuilt. So the shop was removed to 215 Center Street, where it was maintained by Mr. Sievering alone for nine months. Then it was moved back to 209 Center, where the firm operated for about ten years more without change. At each of the early moves, however, the plant had been enlarged, new equipment had been added and a wider variety of work taken in. Then, after these ten years of undisturbed activity, more subway operations made it necessary to move again. This time Mr. Sievering went to 255 Center Street, where he remained for more than five years. The next move was to the first floor of the building at 199 Lafayette Street. Here the plant had 10,000 square feet in which to establish and operate a plant which had been successful practically from the start. The company incorporated in Jan., 1923.

Business continued to increase and when lack of space again became acute, Mr. Sievering took the fourth and fifth floors of the building, leaving the first floor. This doubled his operating area. The addition of the third floor last year was still another step in the same direction.

Philip Sievering, whose energy and forward-looking policies have done most to bring the firm to its present high place in the electroplating industry, began his industrial career in 1877, at Harrison, N. J., where he worked for J. Lagowitz and Company, manufacturers of accessories for trunks and bags. After some years with this company, he left and worked at a variety of "jobs around Newark," as he puts it. Then he went to the Singer Manufacturing Company, sewing machine makers, where he stayed for five years. During the final year and a half there, he was foreman of the plating department. However, ambition, coupled with confidence and a good basic knowledge of plating and finishing, led him to strike out for himself, and he established himself in New York City. His is now the oldest job-plating concern in the city keeping its original name.

Even in the early days Mr. Sievering saw the necessity of chemical training for the plater, and he took a course in chemistry at Cooper Union for four years, attending, of course, in spare hours. Before platers in general had recognized the necessity of doing so, he was keeping his solutions under constant chemical control. His interest in the scientific side of his industry never lags. Always in favor of progress, he was enthusiastic from the first about the research work undertaken by the American Electroplaters' Society in co-operation with the Bureau of Standards, and he is treasurer of the Research Fund of that Society. Both he and Nelson Sievering, his son, are members of the Society and there is rarely a platers' con-

A view of the main plating room at the Sievering Plant. In the right background is seen a long chromium tank, one of several that are operated. Above it may be seen the very heavy bus bars carrying the current for chrome plating. At the left are various still tanks and other equipment

vention, regardless of where held, that is missed by the elder Sievering. He is especially fond of the plant visits made possible by attending the conventions, and he has seen most of the large plants throughout the country. It is on this personal experience that he bases his claim that the Sievering plant is practically the largest exclusively job-plating plant in this country.

The Sievering plant is managed by Mr. Sievering, who is president, and his three sons, Philip, Jr., who is treasurer and general manager; Nelson, who is secretary; and Harry W. Sievering, vice-president and assistant manager. Philip, Jr., entered the firm about eighteen years ago and Nelson about ten years ago, and Philip is in general control of the company's business activities while Nelson gives most of his attention to the details of chemical and electrical control of solutions and apparatus.

The production of barrel-plated work last year was from three to four tons per day, besides a large amount of still-plated work. There are in all about 125 employees, including five head platers and 35 to 40 assistants. The firm handles high grade work as a rule, preferring this to the cheaper types, and most of its business comes from manufacturers and contractors, in quantity lots.

All varieties of plated, oxidized, polished and lacquered finishes are produced under a systematic production plan. Work is handled in various sections of the plant, each supervised by a foreman. Thus, there are men in charge of polishing, brass plating, copper plating, bronze plating, general nickel, nickel to be chromium plated, and silver; and a foreman in charge of the chromium work. Nelson Sievering supervises the last named division.

The polishing department is equipped with four electric polishing machines of Hanson-Van Winkle-Munning and Roth Electric makes; about fourteen belt-driven lathes; two large Munning swinging heads for polishing extra large work; and Gardner ball polishing machines.

In the plating departments are barrel plating machines made by National Galvanizing, Daniels and Orben, Hanson-Van Winkle-Munning, etc. Generators of 1500 and 5000 ampere capacities were supplied by Hanson-Van Winkle-Munning, and one of 3000 ampere capacity was made by the Connecticut Dynamo and Motor Company.

Still Tanks for Nickel and Copper Plating

In the plating department there are still tanks, mechanical plating equipment, rumblers and other apparatus. There are three 12-foot and two 13-foot nickel tanks; a 10-foot tank of brass solution; three 14-foot cyanide copper plating tanks; two 10-foot bronze plating tanks; then there are many smaller tanks, including two acid copper, two cadmium, two silver, a black nickel solution, and eight plating barrels, of which five are for nickel, one copper, one brass and one cadmium. The chromium plating equipment consists of four tanks, the largest of which is 21 feet long.

There are more than thirty tumbling and ball burnishing machines in the plant, and there is sundry other apparatus, such as scratch-brushes, acid dips, tinning apparatus, lacquering equipment (in a special room), and so on.

The 5000 ampere generator was installed last year to supply current for chromium plating. It required two tons of bus bars. The machine was installed on the third floor of the building, which is the new one, where the chromium tanks are. Some of the new space has been

Heavy Motor-Generator Equipment at the Sievering Plant

left for future expansion. The management feels that there are bound to be changes in the constantly growing organization, and it is hinted that a large conveyor for automatic electroplating may be installed before very long.

The business of the firm is so well established that only two salesmen are employed. Most of the business is in repeat orders and contracts from old customers, and from new ones recommended by old customers.

Cleaning Methods

Q.—Could you inform me as to best and simplest method of washing and drying of silverware after rouge buffing for lacquering

Also, I would like to know the best method of stripping silver from lead articles and removing the black oxide. I have tried fine powdered pumice, moistened with oil, and an old buff, but it is hard on the pattern.

A.—The usual practice is to use a soap solution made up of four to eight ounces of neutral soap chips to each gallon of water. Use hot; apply with a plater's cotton swab brush on plain surfaces and a plater's bristle brush on pattern work. Rinse in cold water, run through a cyanide dip to remove stains, again rinse in cold and hot waters, and dry in fine hardwood sawdust, box wood or hard maple, preferred. Dust off and lacquer.

To remove old silver plate from lead articles previous to replating, they should be scrubbed to remove any surface dirt. Hang the articles in a silver plating solution, making the articles the anode. This will strip off the silver without injuring the lead. Or, make a strip solution as follows:

Sodium cyanide	8 oz.
Yellow Prussiate soda	8 oz.
Water	1 gal.

Use cold; make the article the anode; use 4 to 8 volts tension. Copper, carbon or steel cathodes.

After stripping, scratch brush to remove any scum or oxides and handle work through the regular preparatory operations for new work. —WALTER FRAINE

The Cavity Scale for Measuring Throwing Power

A New Method of Measuring the Throwing Power of Electroplating Solutions

BY DR. L. C. PAN
Instructor in Electroplating, College of the City of New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Introduction

WHAT distinguishes a good electroplating solution from a poor one is largely a matter of throwing power. A solution may have high conductivity or it may give high current efficiency, good color and brightness of deposit. But the electroplater will not hesitate for a moment to use one with a high throwing power, even though the current efficiency may not be the highest, or the tank voltage may be considerably higher than other solutions. To him, if a solution does not throw metal into the recesses as well as on the projecting parts of a piece of work, it is of little value.

The practical electroplater is not ignorant of the current efficiency and tank voltage which are the determining factors of the power cost; but the annoyance and labor involved in operating a solution with poor throwing power more than offsets the saving in power cost which may result from the high electrical efficiencies of that solution. For, in most electroplating shops, especially job shops, labor cost is a far bigger item than the power cost, and a solution which does not throw properly will certainly cause a further increase of the labor cost.

DR. L. C. PAN

In view of these facts, the question constantly comes up as to which solution, or which formula for a given metal deposit, gives the best throwing power. It is possible to answer such a question in a very rough way by observing the plating on a piece of intricate work. But to compare throwing power of two or more different plating solutions in a precise manner is, unfortunately, beyond the facilities of the average electroplater. Still more unfortunate is the fact that what the practical plater understands as throwing power is quite different from what the scientist defines as throwing power.[1] To the practical plater throwing power means primarily the power of a plating bath to throw or deposit metal into recessed parts and at the same time not to burn the projecting parts of the work as cathode. Apparently the question of complete covering by a deposit comes before the question of uniform deposit in the primary consideration of throwing power, according to the practical electroplater. This latter conception of throwing power was referred to as "covering power" by Farber and Blum.[2] But the term covering power has been used in certain lines of work to mean the opacity or transparency of a material used as a coating on another. Since, however, as we go up the scale of throwing power or covering power, we have incomplete covering, then complete covering but non-uniform thickness, and finally complete covering and uniform thickness, the two conceptions of throwing power are different only in degree. To use an anology, one person is looking at one end of the scale while the other person is looking at the middle of the same scale. If a person's vision is wide enough he will be able to see the whole scale and the difference vanishes. In this case, if the range of the instrument for measuring throwing power and the scope of the working formula were wide enough we would have no difference in the conception of throwing power and we would not need a new name for the same thing, which is throwing power. But we do need a better instrument and better working formula to measure throwing power, especially at the lower end of the scale. This instrument and formula must be simple, quick in operation, more or less universal and covering the whole range. In the following discussion, an instrument is presented for such measurement of throwing power of plating solutions, which is simple, quick in operation and more or less fool-proof.

Historical

Comparative measurements of throwing power have been made in the past by investigators experienced in the field with methods of various degrees of elaborateness. Horsch and Fuwa[3] used a small cell in which miniature electroplating was carried out with a rod anode and three connected flat cathodes of equal dimensions arranged so that all were in a straight line. Each of the three flat cathodes was accurately weighed before and after the plating operation, and the weight of metal deposit was computed in terms of percentage on basis of total weight of deposit on the three cathodes. If each cathode had 33⅓ per cent of the total deposit, then the throwing power might be called perfect. But if the weight of deposit on each piece should not come out even, then the percentage of deposit would be a measure of throwing power; that is, the closer the percentages to 33⅓, the higher is the throwing power according to these investigators.

Haring and Blum[4] made a fundamental study of throwing power and were the first ones to express throwing power in numerical values. In order to do so, they first translated throwing power into uniformity of metal distribution over the cathode surface. By weighing the parts of cathode at various distances from the anode a "metal distribution ratio" was computed. This ratio when compared with the "primary current distribution ratio," as calculated from Ohm's law, gives percentage

[1] See definition of throwing power, Haring and Blum, Trans. Am. Electrochem. Soc. 44, 320, (1923).
[2] U. S. Bureau of Standards, *Journal of Research*, 4, 39, (1930).
[3] Trans. Am. Electrochem. Soc. 41, 363, (1922).
[4] Trans. Am. Electrochem. Soc. 44, 313, (1923); 46, 107, (1924).

of improvement of one ratio over the other, thus, according to these investigators,

$$\text{Throwing power} = \frac{\text{p.c.d.r.} - \text{m.d.r.}}{\text{p.c.d.r.}} \quad (1)$$

The apparatus used by Haring and Blum was a rectangular cell with slots cut in the sides at definite intervals to accommodte flat sheet cathodes and a perforated or gauze anode. The two pieces of cathode were placed on opposite sides of the anode but at different distances from it. They were connected by a heavy copper bar so that they might represent the two parts of a single piece of cathode. These pieces were weighed before and after a run of 15 minutes or longer at a specific average current density. From the weight of deposit on each cathode and the distance between each cathode and the anode, the metal distribution ratio and the primary current distribution ratio respectively were calculated as follows:

$$\text{m.d.r.} = \frac{\text{Weight of deposit on near cathode}}{\text{Weight of deposit on far cathode}} \quad (2)$$

$$\text{p.c.d.r.} = \frac{\text{Distance betwen anode and far cathode}}{\text{Distance between anode and near cathode}} \quad (3)$$

$$= \text{Distance ratio (d.r.)} \quad (4)$$

From these ratios the throwing power is computed according to equation (1) above.

Since the throwing power of even the same electrolyte under identical conditions varies with the distance ratio of the two parts of cathode with respect to anode, any report of throwing power tested in the Haring-Blum cell must also give the distance ratio at which the throwing power has been measured. Furthermore, when a comparison of throwing power is to be made, it is necessary to see that all measurements have been made at the same distance ratio.

Sizelove and also Pinner and Baker[5] in their "bent cathode test" for determining the throwing power of chromium plating bath, used a copper strip, having a submerged portion 1 inch wide and 2½ inches long, bent at right angles at a point 1 inch from bottom. This bent copper strip was used as cathode in a small chromium plating cell with the bent part facing a lead anode. The extent to which chromium deposits at the bend is taken as a measure of throwing power. This method, although it does not give a numerical value for throwing power, is rapid and easy to carry out even in an ordinary plating shop where an analytical balance and other special apparatus may not be available.

Problems Related to Throwing Power

In spite of the above described ingenious methods of determining the throwing power and some other methods which have a bearing upon throwing power, the fact still remains that the results from any of these tests are only comparative and in certain cases, such as the chormium plating bath, these results do not check with practice. A bath of a certain composition which is found to show high throwing power in a series of such tests, may fail to throw when it is put into actual operation in a plating shop. This happens even when the original idea behind a test or a method of testing is theoretically correct. What makes the test fail to check with practice is only a few little points which we have overlooked.

In Horsch and Fuwa's method of segmented cathode and also in Haring and Blum's throwing power box, it may be noticed that all the cathode surfaces are flat, vertical and parallel to the anode. Such a condition is undoubtedly easy to reproduce, but is rather seldom met in practice. Every electroplater knows that the time when he needs throwing power most is the time when he wants to plate curved surfaces and objects with deep recesses. He also sees a difference between a deep recess and a series of parallel flat surfaces. It is only too obvious that, when a plating bath throws well on parallel flat surfaces, it does not necessarily follow that it would throw also well on curved surfaces and recesses. This is the reason why some throwing power tests failed to furnish the correct information and failed to lead to discovery of high-throwing-power plating baths.

The bent cathode test, although only a qualitative test and applicable to only the very poorly-throwing bath such as the chromic acid bath, yet with the two flat surfaces at right angles to each other, is a big step toward a throwing power test comparable to actual, practical conditions. The two surfaces represent very well a recess in an object to be plated. But here is one more difficulty. The writer had the experience of chromium-plating a linotype mold body made of steel with a number of narrow grooves measuring 1/16 inch wide and ½ inch deep, a section of which is shown in Fig. 1, a. In a certain chromium

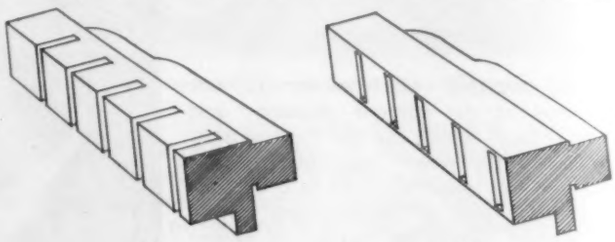


Fig. 1.—Section of Linotype Mold, Showing Grooves and Slots

plating bath a bright deposit was obtained all over the steel mold including the bottom of narrow grooves. But when the same sized grooves were closed up at each end so that they formed slots open only at one side (Fig. 1, b), not a particle of chromium was found inside the slot, although the same bath was used at identical temperature and current density. If we followed a derivation of throwing power as discussed by Haring & Blum,[6] we would know that the cathode polarization at the bottom of the grooves is much greater when the ends of the grooves are closed than when the ends are open. Therefore, even though the distance ratio and the primary current distribution ratio as on that piece of linotype mold remained unchanged, the throwing power was no longer the same.

Take a deep recess on an object like the slots illustrated in Fig. 1, b, the chances are that a solution, such as the chromic acid bath, which has passed the bent cathode test satisfactorily, will not throw metal deposit into the slot. In other words, the requirements for a satisfactory bent cathode test is much less rigid than those for plating various metal parts met with every day in the majority of plating shops. So in order to find out whether a particular bath has enough throwing power to do the most intricate work on hand, the test-piece should be as intricate as the sample to be plated. When such a condition is maintained in a test, the primary current distribution ratio, the cathode polarization and the metal distribution ratio will take care of themselves.

One reason that results of throwing power tests using flat or even bent cathodes are not comparable to actual plating-shop conditions is something which the writer

[5] Trans. Am. Electrochem. Soc. 55, 315, (1929).

[6] Loc. cit.

calls the "electromagnetic effect on the cathode"; that is, the electric current seems to concentrate on the outer surfaces, edges, and projecting parts of an article as cathode. This leaves the recessed part rarefied in current, and when it falls below the critical current density, there will be no deposit; hence the poor throwing power. The electromagnetic effect is especially noticeable when the recess takes the form of a cavity, whether it is round or otherwise. The inside of a cavity is more or less devoid of electricity, even though the primary current distribution calculated from the distance ratios shows only a slight difference between the outside and inside of a cavity.

Another reason that results of throwing power tests using flat or bent cathodes do not check with practical experience in the plating shop is the interference of gas film as a result of deposition of hydrogen at the cathode. With a vertical, flat cathode, or at the outstanding surface of an intricate cathode, the hydrogen gas is free to escape, but in the deep recesses the passage of escaping gas is more restricted, hence gas film is thicker and polarization greater. As a result, little or no deposit is possible in the bottom of the recess. Such a condition, however, is not found in the Horsch and Fuwa method, the Haring-Blum throwing power box or Pinner and Baker's bent cathode test.

The Cavity Scale

In view of these problems, the writer prefers the cavity scale which takes into consideration the electromagnetic effect, the gas film interference as well as cathode polarization, solution resistance and primary current distribution ratio. Furthermore, the cavity scale gives direct and quick measurements of throwing power. It was originally used by the writer to measure throwing power of chromium plating baths, but it was found equally applicable to all types of plating solutions.

Structurally, the cavity scale is a bar of some kind of metal with holes or cavities of various depth representing recesses and cavities in articles commonly handled in the plating shop. Since the throwing power of the same plating bath is often different on different base metals, it is very desirable to make the cavity scale of the kind of metal which this particular bath has to deal with. In this connection may be mentioned metals such as copper, zinc, brass, bronze, aluminum, iron, steel, nickel, nickel silver, zinc base alloys or aluminum base alloys, in either rolled or cast forms. The holes in the cavity scale are made to a uniform diameter and the depths of the holes are graded in percentage of that diameter. This percentage is also used as a rating of throwing power. For example, if a hole in the cavity scale measures 0.5 inch in diameter and 0.05 inch deep, its depth is 10 per cent, of the diameter. And if the cavity scale is plated in a certain bath under a given set of conditions, so that this hole is completely covered but the next deeper one is not, then the throwing power is rated as 10 per cent.

The cavity scale is entirely flexible. It may carry as many holes as desired each with a different depth. The depth of the holes may be made according to the requirements of the tests and the type of bath the throwing power of which is to be measured. For general testing and measurements a cavity scale with ten holes graduated from 10 to 100 per cent (Fig. 2), will answer the purpose very satisfactorily. For instance a single salt type nickel plating bath measures 70 per cent on the steel cavity scale, a 1 per cent sulfate chromium plating bath measures 30 per cent on the same scale, but measures 40 per cent on the brass cavity scale.

In case a very high throwing power is to be measured, the cavity scale may be made to read from 100 to 200 per cent in ten steps. At a rating of 200 per cent, the depth of the hole will be twice its diameter. On the other hand, if a very low throwing power is to be accurately measured, the cavity scale may be made to read from 1 per cent to 10 per cent in ten steps. Furthermore, if a certain problem for investigation requires very fine measurements of throwing power, the cavity scale may be graded to each hundredth, that is one hundred holes are made in the scale or a series of scales, so that the first hole has a depth equal to 1/100 of its diameter and each following hole is deeper than the next one by 1/100 of the diameter. These holes may be marked from 1 to 100 per cent, which is the measure of throwing power. For convenience, these holes may be made on a series of ten cavity scales, the first one of which will be graded from 1 to 10 per cent, the second from 11 to 20 per cent, the third from 21 to 30 per cent, and so on.

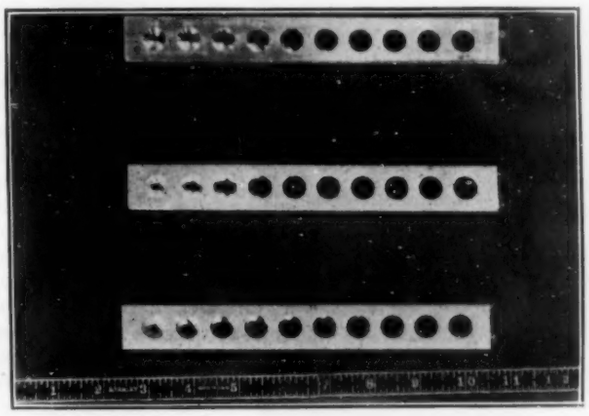


Fig. 2.—Cavity Scale for Measuring Throwing Power

Within wide limits, the exact diameter of the holes on the cavity scale is immaterial as long as the holes in the series are of the same diameter and the depths are made in percentages of that diameter. The cavity scales which the writer had made for meauring throwing power of nickel, cadmium and chromium plating baths are 1 by 1

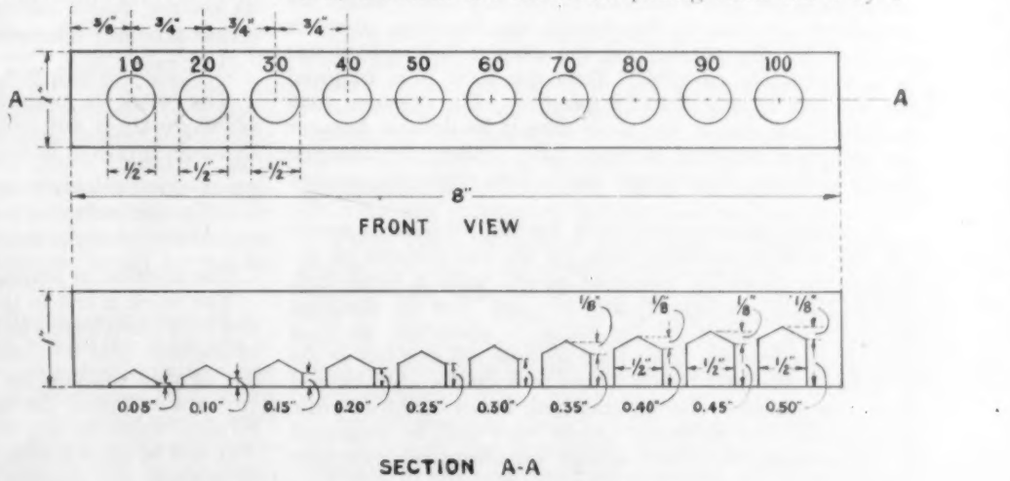


Fig. 3.—Details of Cavity Scale for Measuring Throwing Power

by 8 inches, made of steel and brass with holes ½ inch in diameter and their depth varying from 0.05 inch to ½ inch in ten even steps. (Fig. 3.) The holes are designated as 10, 20, 30, 40, etc., meaning the depths are 10, 20, 30, 40, etc., per cent, respectively of the diameter of the hole.

To minimize the concentration of electricity at the ends of the cavity scale in test, a rack is made so that the current distribution will be practically uniform over the entire face of the scale. (Fig. 4.) This rack is so designed as to fit the cathode bar on any plating tank in any electroplating shop. In the testing of throwing power, current density is always an important factor, and must be correctly set and maintained throughout the test. It is to be specified in all reports on throwing power. To facilitate the computation of electric current to be used on the cavity scale in order to maintain a given current density, the total surface area of the scale together with the rack up to the solution level is stamped on the stem of the rack. Since the solution level in different plating tanks will not stand at the same point on the rack stem, a number showing total surface area in square inches is marked at every inch of the rack stem, the number being the total area up to the mark. The operator watches where the solution level stands on the rack stem, there he reads the number of square inches of surface and sets the plating current according to that and the current density at which the throwing power is to be measured.

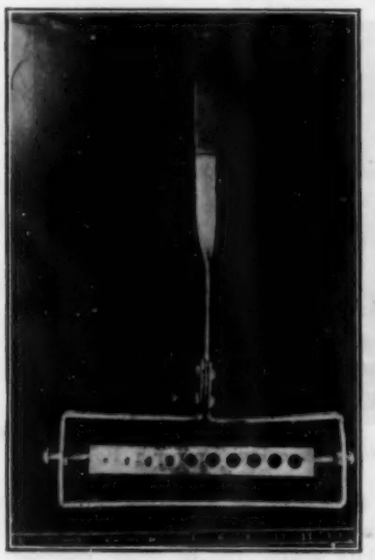


Fig. 5.—Cavity Scale and Rack

The Mode of Operation

When a proper current density is set on the cavity scale, the latter may remain in the plating bath for 5 to 15 minutes depending upon the usual time for plating in the same bath. At the end of this time the cavity scale is taken out, rinsed off and examined to see how many holes are completely covered by the deposit and throwing power is reported by the number on the deepest hole which has been completely covered. Thus the total time required for the test is only 5 to 15 minutes. The operator may do something else at the same time if he desires, because the attention required is very little. After the test the cavity scale may be stripped and is then ready for another test.

In certain experimental work for the purpose of working out a high throwing bath, or for the purpose of restoring the throwing power of an old bath, a small tank of 5 to 10 gallons capacity may be used But for checking the throwing power of the baths in operation, as it is very desirable to do from time to time, all one has to do is to hang the cavity scale in the tank on the cathode rod for a few minutes. Even if the tank is not equipped with an ammeter, the throwing power may still be measured by maintaining the usual voltage consistent with regular practice.

This latter method of testing the throwing power of a bath does not interfere at all with the regular production schedule. But the information will be less valuable than if the exact current density is also known.

Although the cavity scale does not measure directly the uniformity of thickness of deposit in a gravimetric way, we are certain that the throwing power in percentages on the cavity scale is a true measure of the uniformity of thickness of deposit also.

Advantages of Cavity Scale

While the writer does not claim any absoluteness in the cavity scale for throwing power measurements, nor does he pretend to replace all other methods and devices for throwing power tests, the cavity scale has undoubtedly the following advantages:

1. It is a quantitative as well as qualitative test of throwing power.
2. It is direct reading, involving no weighing, no special set-up, no accessories and no "figuring" or computation.
3. All results are expressed in whole numbers and never in negative values.
4. It is flexible and covers all types of solutions. Its usefulness is not limited either by the very lowest or by the very highest throwing power.
5. Each number of throwing power has a direct and definite meaning independent of local conditions or structural irregularities incident to the individual pieces of apparatus.
6. It permits a very fine measurement of throwing power, which is an important advantage especially in research work.
7. The cavity scale is free from personal errors and does not depend upon the judgment of the operator.
8. The cavity scale truly represents the actual situation in which the throwing power is most in demand.
9. It not only takes care of the primary current distribution ratio, but also takes into consideration the electromagnetic effect on a cathode and the interference of gas films on recessed parts.
10. The cavity scale is simple and sturdy in construction, quick in operation, requiring the least amount of labor and time. It is fool-proof.

Dip Finish for Brass

Q.—We are sending you a sample of finish. Please give us instructions for producing this finish on cast and sheet brass articles. A quick acting solution is preferred as we will find it necessary to pour it over some of our larger articles. The smaller articles can be dipped.

A.—The sample was finished as follows:

The work is polished and colored then cleansed of polish grease in any suitable cleaner on the market. After cleaning, immerse in the following solution:

Golden sulphuret antimony	4 oz.
Caustic soda	8 oz.
Water	1 gallon

Use solution at boiling temperature.

The work is left in this solution for one or two minutes and then transferred to the second solution which is made of sulfuric acid 4 ounces, water 1 gallon. The work is left in this solution for a few seconds. The operations are repeated until the desired shade of color is produced. Finally, finish by dry scratch brushing and lacquering.

It will be quite a difficult job to produce a uniform finish by pouring the solution over the work.

OLIVER J. SIZELOVE.

Variations in Thickness of Nickel Deposits

Experiment to Determine Different Thicknesses of Deposit in Different Parts of the Tank—Part 1.

By LELAND E. GRANT and VERNON E. GRANT

Formerly Chief Chemist and Electroplating Foreman, Respectively, of the New Departure Manufacturing Company

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

IT is well known that electro-deposited nickel is seldom, if ever, uniform in thickness on an article plated by the usual commercial methods. Even under laboratory conditions it is very difficult to produce an even deposit on a cathode of irregular shape. Unevenness of deposits is not always evident on inspection of the plated articles but frequently it does manifest itself, being indicated by a slight dulling of the deposit on the edges or corners, also in more severe cases by a "burned" or rough deposit. This condition has been known for a long time. Barbour[1] discussed one phase of it some twenty years ago but specific references to it in the literature of electro-plating are not numerous. The practical plater knows that this is a trait of plating baths in general and of nickel and chromium in particular. He has learned to minimize the tendency by the use of dummies, special anodes, and various other devices so that a commercially acceptable and useful deposit can be obtained. The technical investigator, while aware of this problem, seems to have given it but little attention. This is to be regretted since there are involved many of the fundamentals of electro-plating and a thorough investigation would undoubtedly throw much light on many features of electro-plating not now well understood.

If a single article has a nickel deposit that is not uniform what is the condition of a large number of pieces plated simultaneously? To the plater who is working with chromium the answer is simple and frequently all too obvious, unless elaborate arrangements have been made to produce a fairly uniform deposit on the various pieces. In nickel plating the pieces may all appear to be uniform but is this uniformity actual or only apparent? Do the pieces on the bottom of a rack, for example, have the same quantity and distribution of deposited metal as those at the top? Obviously the answers to these questions are important as they involve not only the uniformity of deposit on an individual article but also the general uniformity of the thousands of pieces that the plating department turns out. Since nickel is applied as a decorative and protective coating it is very desirable that it be uniform so that unsightly rust spots will not appear.

The authors considered the above questions in connection with the nickel plating of coaster brakes and bicycle bells. Various parts of each were plated separately so it was desirable to have a deposit on them that was as uniform in thickness as possible, otherwise the long exposure to the weather would cause corrosion wherever the deposit was scanty and a dissatisfied customer would be the result.

Some experiments were accordingly undertaken to determine how much variation there was in the thickness of the nickel deposit on pieces plated in various parts of one tank. Also how much the pieces in one plating tank varied from those in other similar tanks. The experiments were all carried out under the regular plating room conditions so that results of a practical nature would be obtained. They extended over a period of about two years. It is reasonable to believe that the results are applicable, at least in a general way, to nickel plating as it is done in the average plating room.

There were eleven nickel tanks included in the tests. These held approximately two hundred gallons of solution and were arranged with anodes on each side and a row of cathode racks in the center. The general plan of the tanks is shown in Fig. 1. The anodes were spaced

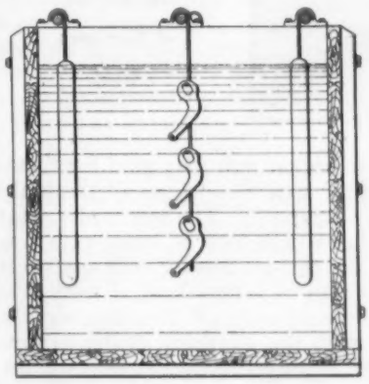


Fig. 1.—End View of Tank, Showing Arrangement of Anodes and Work Racks

five inches between centers and varied in length from the eighteen inches of new anodes to about six inches of the practically consumed anodes. Short anodes were always placed between longer ones. One of the tanks was double, that is, it had three rows of anodes and two rows of cathodes. As it was only slightly wider than the single tanks the eight inch anode to cathode distance of the single tanks was reduced in this tank to about four inches.

The plating solution was of the following composition:

Single nickel salts ($NiSO_4.7H_2O$)	16 ozs / gal.
Ammonium Chloride (NH_4Cl)	2 ozs / gal.
Boric Acid (H_3BO_3)	2 ozs / gal.

The solution was maintained by the addition of one ounce per gallon per week of single nickel salts with cast anodes; ½ oz. per gallon weekly with electrolytic anodes. Ammonium chloride was added at the rate of one ounce per gallon per month. Frequent chemical analyses for nickel and chlorine were made to see that the solution was maintained fairly constant. In a few instances sodium chloride was substituted for ammonium chloride.

Three types of anodes were used. These were cast, electrolytic, and heat treated rolled anodes. Only a few experiments were made with the cast. The cast anodes had 95 to 97% nickel and the electrolytic quoit anodes 99+% nickel. Anodes of the different types were always used separately in a tank, two different types never being used together.

An attempt was made to hold the pH between 5.6 and 6.1 but with the electrolytic anodes especially this was difficult to do and required frequent additions of acid. The pH was much more readily maintained uniform with

[1] Met. Ind. Vol. 6-P9 (1908).

cast anodes. At first concentrated sulphuric acid was added when the pH needed to be lowered. Later concentrated hydrochloric acid was used. With sulphuric there appeared to be a much larger amount of a brown sludge formed. This brown sludge presumably was a basic sulphate of iron since it contained both iron and the sulphate radical. The presence of the hydrochloric acid appeared to retard its formation. The pH was normally adjusted about twice a week; at times it was adjusted daily.

During most of the last year of the experiments a suction filter pump was used to keep the solutions free from suspended matter.

The current density was intended to be held at approximately five amperes per square foot. Preliminary experiments had shown that the old style rheostats then in use were far from adequate for such control as the steps were much too large. The work received either too much or too little current. Several new rheostats were obtained which were sufficiently sensitive to provide the control

Fig. 2.—Type of Specimen Used

desired. It soon became evident that they paid for themselves by the elimination of spoiled work so all the tanks were eventually similarly equipped. The tables of results show the total current for a tank load of work as it was impossible to determine the current density with any great accuracy. However, the area of a tank load of work was fairly uniform since the pieces were all the same and the racks very similar. Though the efficiency in the various tanks might vary slightly, from a practical standpoint any given current would produce the same total quantity of deposit in the various tanks.

The type of specimen used is shown in Fig. 2, slightly enlarged. These were placed thirty six on a rack six racks to a tank as shown in Fig. 3. In the double tank twelve racks were plated simultaneously. The thickness of the deposit was usually determined where the line is drawn on the large end of the brake arm (Fig. 2). The line across the piece at the smaller end shows where a second measurement was made on a few specimens.

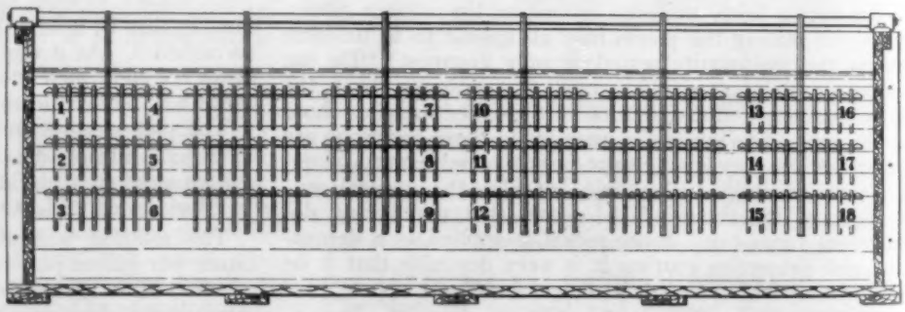


Fig. 3.—Side View of Tank Showing Arrangement of Work in Racks. Numbers Indicate Location of Test Specimens

Fig. 3, shows the numbering of the locations of test pieces. These are the numbers appearing in the tables in the column "Position of Specimen."

The plating time was one hour in all experiments here reported.

For determining the variations in thickness of the deposit two methods were used. In the first the actual thickness of the deposit was measured through a microscope. The specimens were first brass plated, this being the regular procedure at that time. The brass plated pieces were buffed, cleaned, plated in the nickel tank and, after thorough rinsing, returned to the brass plating tank for another hour. The nickel deposit was, therefore, sandwiched between two layers of brass plate. A thin slice

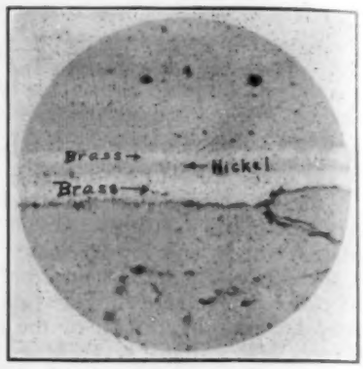


Fig. 4.—Thin Nickel Deposit

was cut out of the brake arm at the line shown on the large end in Fig. 2. This cross section was carefully

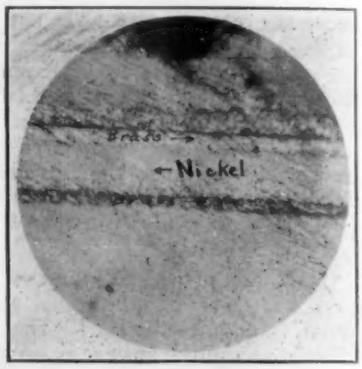


Fig. 5—Thick Nickel Deposit

polished and placed on the stage of a metallurgical microscope. The nickel deposit was then visible sharply outlined by the layers of brass. The appearance of thin and thick deposits respectively is shown in Fig. 4 and 5. The thickness was accurately determined by a calibrated micrometer eyepiece. The results thus obtained are the figures shown in the tables in the "Thickness of the Deposit" column.

The second method consisted of weighing the amount of deposited nickel on the specimen. After brass plating and buffing the piece was cleaned, weighed on a chemical balance, hung on the rack with the rest of the work and plated with nickel for an hour. It was then rinsed, dried, and reweighed.

This paper will be concluded in an early issue.—Ed.

Electrochemical Society Meeting

Abstracts of Papers Read at the 57th General Meeting of the Electrochemical Society, St. Louis, Mo., May 29-31, 1930

THE PREPARATION OF PURE ELECTROLYTIC NICKEL

Part 1.—The Elimination of Copper from Nickel-Copper Electrolytes.

By Colin G. Fink and F. A. Rohrman

1. A history and classification of the methods for removing copper is given.
2. Experiments were run on the effects of pH, current density, metal ion concentration, temperature and agitation upon the cathodic deposit.
3. A high acidity, low current density, high temperature and stirring favor copper deposition.
4. A method for the rapid removal of more than 90 per cent of the copper present as an impurity in nickel solutions is given.

SOME CONDUCTIVITY CHARACTERISTICS OF CHROMIC ACID AND CHROMIC ACID CHROMIUM PLATING SOLUTIONS

By Robert H. Cherry

From the standpoint of power consumption the results of this investigation indicate that chromium plating baths should have a concentration of 4.5 molar CrO_3 at 45° C. and 3.75 molar at 25° C. It is shown that for all practical purposes the increase of conductivity of chromic acid solutions is a linear function of the temperature, over the range of temperatures covered in plating work. It is shown that the addition of the sulfate ion has the effect of increasing the conductivity of the solution to a maximum when the sulfate ratio is approximately 50, which coincides with the sulfate ratio giving optimum cathode efficiency. Calculations of pH from conductivity data are in fair agreement with the values obtained by other investigators employing potential methods. The hydrogen and quinhydrone electrodes are definitely shown to give erroneous pH values in chromic acid solutions. Furthermore, the platinized-platinum oxygen electrode is shown to be inaccurate in chromic acid solutions.

REPRODUCIBILITY IN CORROSION WORK

By Ulick R. Evans

Lack of agreement between two "identical" corrosion experiments may be due (1) to experimental causes, such as non-uniformity of material, surface condition, or physical conditions, especially those affecting the oxygen-supply, (2) to fundamental causes, which can be discussed from the probability standpoint. Corrosion usually starts from independent points, believed to be weak places on an invisible oxide-film, and where the number of these points on each specimen is small, considerable variation from the mean is to be expected. There is, however, evidence that each breakdown gives protection to the surrounding territory, thus decreasing the probability of other breakdowns, and this automatically makes the reproducibility better than that which would be calculated from Poisson's formula.

A MODEL TO EXPLAIN THE MECHANISM OF ELECTROLYSIS

By M. deKay Thompson

A model is described which illustrates the mechanism of electrolysis, showing the following: (1) that there is no change in the middle portion; (2) that the solution remains electrically neutral at the electrodes; (3) that the loss at the anode is proportional to the velocity of the cation, and the loss at the cathode is proportional to the velocity of the anion. This is done for three different relative velocities of anions and cations.

THE BETTS ELECTROLYTIC LEAD REFINING PROCESS IN PRACTICE

By J. J. Fingland

The Trail electrolytic lead plant is the pioneer Betts' plant. The cells, arranged in multiple and cascade, are made of concrete and lined with asphaltum. The general layout of the cell room is similar to that of the copper refinery at Great Falls. For the circulation of the electrolyte, plunger and centrifugal pumps constructed of copper with monel metal wearing parts are used. Details as to equipment and operation are given. Much higher percentages of impurities (up to 2 per cent) are permissible in the lead anodes than in the respective copper anodes. Silver in the cathodes must be kept as low as 2 to 7.5 mg. per kg. of refined lead. The usual impurities in the lead bullion (anodes) are commonly present in such proportions that they will remain in the antimony slime sponge; copper is an exception. Copper present in the bullion in excess of 0.04 per cent will form a hard skin on the surface of the anode insoluble in hydrofluosilicic acid. The electrolyte demands frequent analytical control. Methods for the production of H_2SiF_6 are given in detail. Due largely to the accumulation of the antimony sponge on the anode surface, the initial cell potential of 0.35 volt rises during the course of days to 0.70 volt (at 2 amp./sq. dm.). Control of the H_2SiF_6 content of the sponge is important. The treatment of the anode sponge for the recovery of gold and silver presents no unusual features. About 80 per cent of the bismuth contained in the bullion is found concentrated in the copper oxide slag recovered just prior to the finishing of the doré charge.

INDUSTRIAL EDUCATION FOR THE ELECTROPLATING INDUSTRIES

By C. L. Mantell

A new, two-year, intensive course of a non-collegiate type is described. In the course of instruction emphasis is laid on development of practical ability and executive capacity. About one-half the time is spent in the laboratories, shops, and drawing and design rooms. A complete semi-commercial electroplating installation is available for instruction purposes. Furthermore, solutions are analyzed and products are tested. Special study of plating generators and electrical machinery peculiar to the plating industry is included. The demand for the graduates has been in excess of the supply.

THE AJAX-WYATT OR VERTICAL RING INDUCTION FURNACE

As applied to Melting Non-Ferrous Metals

By William Adam, Jr.

The specifications for an ideal electric melting furnace are laid down, and operating data are presented to show that the vertical ring induction furnace more nearly meets these specifications than any other type of furnace. With

this furnace thermal efficiencies as high as 85 per cent have been obtained. There are few large power consuming devices that have as smooth an operating curve as the vertical ring induction furnace. The stirring action is due to the combined motor, pinch and joule effects. The power input of the vertical ring induction furnaces varies from 45 kw. to 150 kw. and the pouring capacity from 400 to 2,200 pounds (180-1,000 kg.) per heat. Single phase is preferable to polyphase, on account of its extreme simplicity.

ELECTRODE POTENTIALS OF SILVER IN CYANIDE SOLUTIONS

By Colin G. Fink and G. Byron Hogaboom, Jr.

Polarization potentials heretofore recorded for silver in silver cyanide-sodium cyanide solutions have varied widely. Accepted "standard" methods for determining polarization values have given discordant results. The authors therefore investigated the behavior of solid silver plate electrodes, and found that the polarization potentials are highest near the upper edge of the square plates and lowest near the lower edge. The difference in values obtained is attributed to the behavior of the solution film next the electrode surface. Uniformly consistent polarization potential values seem possible only when the surface film is of uniform composition and structure throughout.

ELECTRODEPOSITION OF COPPER-NICKEL ALLOYS

Lawrence E. Stout, Oscar G. Burch and A. S. Langsdorf

Quantitative data on the factors controlling the percentage composition of an electrically deposited alloy are meager, except for a few isolated binary and ternary systems. This study of the deposit obtained from the copper-nickel system shows that: (1) the per cent of copper in the plate is always greater than that of the bath, the difference becoming progressively greater as the copper content of the bath increases; (2) the ratio of copper to nickel on the plate increases linearly with the temperature; and (3) low current densities favor the deposition of high copper alloys. Increase in free cyanide content was found to decrease the rate of deposition, agreeing with the observations made by Kremann on the copper-tin and copper-antimony systems. Probable empirical equations to fit the data are given.

THE PRODUCTION OF CONTINUOUS AND SEAMLESS TUBING BY ELECTRODEPOSITION

By Jean Billiter

Two electrolytic methods are described for the production of continuous or endless metal (Cu, Fe) tubing. In the first method metal is deposited on a short, slightly conical mandrel of chrome or silicon steel (to which the deposit does not adhere), and at regular time intervals the tube is moved slightly forward over the mandrel, thereby exposing a short, bare section of mandrel. During the next time interval a new deposit forms over this bare section and also over the deposit produced during the previous time interval. In the second method a low-melting hollow mandrel (lead) is slowly passed through a plating cell.

THE BENT CATHODE TEST FOR CONTROL OF CYANIDE COPPER BATHS

By Walter L. Pinner and Edwin M. Baker

In a cyanide copper plating process the constituents of the bath, temperature of operation and cathode current density have a definite effect on the characteristics of the deposit. This is made the basis of an empirical method of control. Certain optimum ratios of free sodium cyanide to sodium copper cyanide are noted, together with corresponding temperatures and current densities. The effects of varying the concentration of the constituents of a typical copper cyanide bath are presented.

INDIUM: RECOVERY BY ELECTRODEPOSITION

By L. R. Westbrook

The comparatively rare element indium is found in very small amounts in process residues obtained in the purification of crude zinc liquors, made from zinc cinder or blende containing traces of it. By treating the crude liquors with metallic zinc, indium if present is precipitated out, together with cadmium, lead, tin, antimony, copper and nickel. Over one pound of the metal was recovered from the residues for experimental purposes. Separation from most of the accompanying elements was accomplished chemically, and the final isolation by electrodeposition of the metal from a citrate bath, representing the best of several electrolytes investigated.

THE SERIES OF ELECTROLYTIC COPPER REFINING AT NICHOLS COPPER COMPANY

By Frank R. Corwin and Carleton S. Harloff

During recent years, the Nichols Series System of Electrolytic Refining has been developed so that improvements made, together with its inherent qualifications, have placed it in a strong competitive position with the multiple system as to quality of production, grade of material handled, cost of production, tie-up of metals in process and precious metal loss to cathode.

SOME RECENT CONTRIBUTIONS TO THE ELECTROCHEMISTRY OF STRONG ELECTROLYTES

By Pierre J. Van Rysselberge

Experimental data are presented which show that incomplete dissociation prevails in all solutions of strong electrolytes. In the case of divalent ions, complex formation occurs. A method of calculating the concentrations of the different ionic species present in a solution is sketched. A new form of dissociation theory is developed, based upon the Fermi statistics. It yields theoretical results for activity coefficients in good agreement with the experimental data; it also yields a measure of the degree of dissociation of electrolytes in higher concentrations. The theory leads to a new definition of ionic strength. Suggestions for the application of these new facts and ideas to electrolytic processes are presented.

THE PRODUCTION OF ELECTROLYTIC IRON PRINTING PLATES

By C. T. Thomas and W. Blum

Thick printing plates are being made by depositing iron from baths than contain about 3 *N* $FeCl_3$, 2 to 4 *N* $CaCl_2$ and 0.01 *N* HCl. A cathode current density of about 7 amp./sq. dm. (65 amp./sq. ft.), is used and a temperature of about 90° C. (194° F.). The anodes are suspended in porous alundum diaphragms. The deposited iron has a tensile strength of about 4,000 kg./sq. cm. (56,000 lb./sq. in.) and an elongation of about 20 per cent. The finished plates are plated with chromium to increase the resistance to abrasion.

THE SOLUBILITY OF ZINC IN SULFURIC ACID

By F. W. Harris

An apparatus is described whereby the rate of evolution of hydrogen from zinc in acids can be readily measured. A cone-shaped cast specimen is used, which, after treating in sodium hydroxide to remove superficial metal, is corroded in 20 per cent sulfuric acid, until a constant

surface and a constant rate of gas evolution are attained. The specimen is then tested in dilute sulfuric acid, and the rate of dissolution is expressed in terms of cubic centimeters of hydrogen evolved per minute. The effect of minute additions of impurities is measured, using 99.992 per cent zinc as a base. Of the impurities tested, copper, iron, and antimony have the most pronounced effect, in the order named. Cadmium and lead have only a small effect, and aluminum is practically inert. When very small quantities of gelatin are added to the acid, gas evolution is markedly inhibited. Sodium silicate, on the other hand, has only a slightly inhibiting effect.

ADDITION AGENTS IN BISMUTH ELECTROLYTES

By Edward F. Kern and Thomas R. Jones

Solutions of fluosilicate, fluoborate, cresol sulfonate, perchlorate, fluoride, sulfate, and chlorides were tested for electrolytes of bismuth, resulting in the selection of bismuth chloride solutions containing sodium chloride, calcium chloride, or magnesium chloride as the most suitable electrolytes. The addition agents tried were glue, goulac (sulfite residues), gum Arabic, tannin, aloin, aloes Curacoa, hydrochinone, benzoic acid, pyragallol, and resorcine. Pyragallol and resorcine added to the electrolytes, produced the brightest and densest deposits of bismuth; hydrochinone was next in order, benzoic acid next, and the other addition agents were not beneficial.

GERMANIUM IN RELATION TO ELECTROLYTIC ZINC PRODUCTION

By U. C. Tainton and E. T. Clayton

Certain impurities in the zinc solution, if not removed, will deposit with the zinc and lower the overvoltage below the critical point. In the "high-acid high-density" process, Sb, Co, Ni and As, which are objectionable impurities, are readily removed. However, a hitherto unsuspected impurity which gave rise to low current efficiencies was, after careful investigation, found to be germanium. Concentrations as low as 1 mg./L. are sufficient to cause serious losses in efficiency. Germanium may be adsorbed and removed from solution by means of ferric hydrate precipitated by zinc oxide in the leaching operation.

THE ELECTROLYTIC ZINC PLANT OF THE EVANS-WALLOWER COMPANY, EAST ST. LOUIS

By U. C. Tainton and Daniel Bosqui

The Joplin district will probably continue for many years to be the chief zinc producing district of the United States. Hitherto, all zinc from this field has been produced by the old process of retort smelting, and the paper describes the first plant to treat these ores by electrolytic methods. Flotation concentrates are roasted in Wedge furnaces, the roaster gas being converted to sulfuric acid by the contact process. After passing over magnetic separators, the concentrates are leached in spent electrolyte (28 per cent H_2SO_4). The heat of the reaction raises the temperature to boiling point. Residue containing lead, silver, and gold, are shipped to the lead smelter. Leached solution is purified with zinc dust to precipitate copper, cadmium, cobalt and nickel. The cadmium is separated from the copper and recovered electrolytically, while the cement copper goes to a copper smelter. In the zinc cells aluminum cathodes are used at a current density of 100 amp./sq. ft. (10.7 amp./sq. dm.) Anodes are in grid form, and are composed of lead alloy containing 1 per cent of silver. During electrolysis, manganese dioxide is precipitated, yielding a high grade product free from iron, copper, nickel, etc. The electrolytic zinc produced is 99.99 per cent pure. The daily capacity of the plant is 50 tons of electrolytic zinc, and 1,000 lbs. (454 kg.) of cadmium.

(For a description of this process see The Metal Industry, for May, 1930, pages 233-4)—Ed.

Spot Welding Sheet Brass and Copper

Q.—What is the best method to use for spot welding sheet metals? Let us know if it is superior to riveting.

A.—Where two sheets of metal have to be joined, instead of using a riveted joint, a spot welded joint can be used, and if properly made it will be more permanent than a riveted joint. Spot welding is faster than riveting as there is no possibility of the joint loosening.

The operation is done on a machine. This has two electrodes between which the two sheets to be joined are placed. When current is turned on, the two sheets are locally heated to their fusion point, which forms a firm weld.

When welding together two sheets of dissimilar metal, the electrodes should be chosen to suit the combination of metals.

If a high resistance metal is to be welded to one of lower electrical resistance, a low resistance electrode is used in contact with the latter. If the resistances of the electrodes are properly chosen, they will give a balanced heating effect on both metals.

The welding current and pressure must be regulated according to the thickness of the sheets being welded; the best guide to this is experience.

Aluminum and brass can be welded by using cooper-tungsten electrodes containing the proper amount of tungsten to give the requisite resistance.

Sheet copper is a difficult metal to spot weld. Electrodes of pure tungsten should be used, with a relatively high welding current and pressure. When welding sheets such as copper to galvanized iron, or copper to nichrome, use an electrode rich in tungsten next to the copper, and a copper electrode next to the galvanized iron or nichrome. The low resistance copper electrode in contact with the high resistance galvanized iron or nichrome helps to conduct away the heat generated through its high resistance, while the high resistance copper-tungsten electrode in contact with the low resistance copper increases the heat in this metal. If the same type of electrodes were on both, the temperature of the copper would be much less than that of the higher resistance metal, due to its lower electrical resistance.

When welding sheets of similar thicknesses, the electrode in contact with the thinnest sheet should be slightly larger in diameter than the other electrode. This will be found to improve the heat balance.

Owing to the high cost of tungsten and high-tungsten-copper alloys, the electrode is made of copper fitted with a tip of one of these metals.

Metals to be joined by spot welding should first be cleaned of dirt, oil, scale, etc.

If due care is taken and overheating avoided, a spot welded joint should be strong and permanent, and not liable to loosen under continued stress and vibration.

P. W. Blair.

Foundrymen's Convention and Exhibit in Cleveland

Largest Attendance, Number of Exhibitors and Floor Space Taken in History of the American Foundrymen's Association, in Cleveland, May 12-16, 1930

THE largest and best attended convention in the history of the A. F. A. was held in Cleveland, May 12-16, 1930. It was the 34th annual convention and the 23rd exhibition of the Association. Over 7,000 members and visitors registered; 249 firms exhibited; 84,000 feet of floor space was taken.

The exhibits were housed in the Cleveland Auditorium, supplies being shown in the Auditorium proper, equipment in the Annex and educational institutions exhibiting in the Arcade connecting the two. They were all attractively laid out and showed a complete line of foundry materials.

New Officers

The new officers were elected as presented by the nominating committee, as follows:

President: N. K. B. Patch, secretary, Lumen Bearing Company, Buffalo, N. Y.

Vice-President: E. H. Ballard, superintendent in charge of foundries, General Electric Company, Lynn, Mass.

Directors for 3 years: Fred Erb, retiring president, Erb-Joyce Foundry Company, Detroit; **C. S. Anderson,** vice-president and general manager, Belle City Malleable Iron Company, Racine, Wis.; **H. R. Culling,** vice-president, Carondolet Foundry Company, St. Louis; **R. M. Maull,** treasurer and sales manager, Tabor Manufacturing Company, Philadelphia; **D. M. Scott,** vice-president, Symington Company, Rochester, N. Y.

Prize to Personnel Director

One of the Prize Papers of 1929 was designated in "Foremen Training," by A. D. Lynch, personnel director of the Ohio Brass Company, Mansfield, Ohio.

Exhibits for Non-Ferrous Foundries

Exhibits for non-ferrous foundries were numerous, and in many cases, elaborate. Nothing of a revolutionary character was shown, but a wide variety of improvements in detail in all sorts of equipment and supplies. A list of exhibits of interest to metal foundries follows:

Ajax Electrothermic Corporation, Trenton, N. J. 1,000 lb. coreless high frequency induction furnace and enlarged photographs of installations.

The Ajax Metal Company, Philadelphia, Pa. Brass and bronze ingot metals of all kinds. Flux metals. Ajax-Wyatt electric furnaces. Ajax golden anniversary display.

Albany Sand & Supply Company, Albany, N. Y. Samples of Albany molding sand, blast sands, etc.

Alloys & Products, Inc., New York, N. Y. Metal alloys of all descriptions.

The American Foundry Equipment Company, Mishawaka, Ind. Sand blast and dust arrester equipment, sand, cutting and conditioning machines, flasks and jackets, and core machines.

The American Steel Abrasives Company, Galion, Ohio. Steel abrasives, steel shot and grit.

Apex Smelting Company, Chicago, Ill. Aluminum and its alloys in ingot pig and shot (granules) form. Castings made from Apex aluminum alloys. Apex aluminum flux.

The Asbury Graphite Mills, Asbury, New Jersey. Graphite, crude and refined, for all uses. Special display of grades to meet the needs of any foundry.

The Ayers Mineral Company, Zanesville, Ohio. Molding sands for iron, steel, brass and aluminum. Silica wash. Filter sand and glass sand.

View of Foundry Supply Exhibits

The C. O. Bartlett & Snow Company, Cleveland, Ohio. Small sand handling equipment for feeding sand to two molding machines.

H. L. Baumgardner Manufacturing Corporation, Fremont, Ohio. Complete line of Hines patent slip flasks with cast iron and aluminum jackets.

Bausch & Lomb Optical Company, Rochester, N. Y. Metallographic microscopes, wide field and binocular microscope, optical measuring instruments for industries and magnifiers and reading glasses.

The Black & Decker Manufacturing Company, Towson, Md. Heavy duty grinders, portable grinders, portable electric drills, and portable electric saws.

Bradley Washfountain Company, Milwaukee, Wis. The Bradley Washfountain, a modern, sanitary, economical wash fixture for group washing.

The British Aluminum Company, Limited, New York, N. Y. Aluminum, ingots, virgin and alloys. Castings in sand, permanent mold, and die castings.

The Buckeye Portable Tool Company, Dayton, Ohio. Complete line of Hercules rotary type portable air tools. New No. 113-3 pencil grinder, No. 320-3 grinder for 4" diameter wheels and No. 362-4 grinder for use with 6" diameter counterbore wheels and with 9" felt pads and abrasive discs.

The Buckeye Products Company, Carthage, Cincinnati, Ohio. Buckeye parting, Linseal core oil, No-Boil core paste, Linco, Buckeye flask guides, Buckeye high temperature cement, Speedie buffing compositions.

Bullard-Davis, Inc., New York, N. Y. First aid kits and supplies. Inhalators, gas masks, combustible gas indicators. Safety clothing, safety shoes and safety equipment.

The Campbell-Hausfeld Company, Harrison, Ohio. Hausfeld metal melting furnaces for gas or oil fuel. Each furnace a complete unit with direct connected electric-driven blower and oil pump. Tilting type crucible. Stationary crucible type for melting brass, bronze and aluminum.

The Carborundum Company, Niagara Falls, N. Y. A complete display of Carborundum brand abrasive and refractory products.

The Carborundum Company, Refractory Division, Perth Amboy, N. J. Recuperator model mounted on Carbofrax recuperator tubes assembled with core-busters and terminal wall blocks. Carbofrax brick, tile, cements and special shapes.

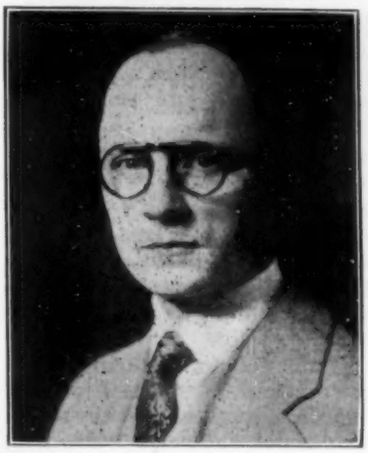
Chicago-Naugatuck Crucible Company, Shelton, Conn. Graphite crucibles, all shapes and sizes, for steel, brass, bronze, monel, nickel, precious metals and various alloys. Graphite silicon carbide and clay of various shapes.

Cleveland Electro Metals Company, Cleveland, Ohio. Ingot aluminum. Aluminum shot.

The Cleveland Flux Company, Cleveland, Ohio. A complete and descriptive display of Cornell parting and fluxes, including our brass, bronze, aluminum, iron, semi-steel and ladle fluxes for all metals.

The Combined Supply & Equipment Company, Inc., Buffalo, N. Y. "Angle Stem" and "Double Angle" chaplets. The Bowers paster. Cast aluminum pattern plates.

Corn Products Refining Company, New York, N. Y. Cores made from our cereal binders. These materials for foundry purposes are Mogul, Kordek and Dextrine.



R. M. MAULL

Treasurer, Tabor Manufacturing Company, Philadelphia, Pa.

A Newly Elected Director of the A. F. A.

The John L. Cummings Company, St. Joseph, Mich. Special refractories for the grey iron, brass, steel and aluminum foundry.

The Dayton Oil Company, Dayton, Ohio. Core oils and cores.

The Deister Concentrator Company, Fort Wayne, Ind. Type M mobile foundry screen grizzly equipped. Leahy screen combined with popular make of sand blender and slinger. Leahy screen combined with popular make of sand mixer or muller.

William Demmler & Brothers, Kewanee, Ill. Core blowing machines in operation.

Detroit Electric Furnace Company, Detroit, Mich. Detroit rocking electric furnace, 740 to 1,000 lbs. capacity, in operation. Also a complete line of brass, bronze, grey iron and nickel alloy castings manufactured in the Detroit electric furnace.

Harry W. Dietert, Detroit, Mich. Foundry molding sand and core testing machines for both control

View of Foundry Equipment Exhibits

and research tests, meeting A. F. A. Specifications. A complete line of testing equipment.

DeWalt Products Corporation, Lancaster, Pa. DeWalt combination cross cut and rip saw for pattern shops making flasks and patterns. DeWalt 6" jointer. Extra long 44" table. DeWalt metal cutter.

Joseph Dixon Crucible Company, Jersey City, N. J. Graphite crucibles, stoppers, nozzles and sleeves; clay refractory nozzles, combination nozzles, clay refractory sleeves, assay sand crucibles and refractories, graphite facings and core washes.

J. E. Dockendorff & Company, Inc., New York, N. Y. Neuhausen Rising Sun brand Swiss aluminum ingots, and castings made therefrom.

Drying Systems, Inc., Chicago, Ill. Core and mold ovens, japanning and enameling ovens. Heating equipment for indirectly heating all types of industrial ovens. Ovens for rod baking and low temperature heat treating.

The D. A. Ebinger Sanitary Manufacturing Company, Columbus, Ohio. Ebco sanitary toilet and wash room equipment. Drinking fountains, wash sinks, water closets, urinals, steel toilet, shower and dressing room partitions.

Electro-Chemical Pattern & Manufacturing Company, Detroit, Mich. Copper pattern equipment made by electrolytic deposition of copper. Copper patterns made directly from the single shrink working pattern.

The Electro Refractories Corporation, Buffalo, N. Y. Tercod crucibles and refractories.

Fanner Manufacturing Company, Cleveland, Ohio. Foundry chaplets, foundry chills, foundry nails. Nailing plates, core plates, gaggers, core wires. Tin specialties, flask trimming and tumbling stars.

The Federal Foundry Supply Company, Cleveland, Ohio. Complete sand control equipment for foundry laboratory. Demonstration of the use of Federal green bond in sand reclamation. Foundry facings and supplies.

The Ferro Enamel Supply Company, Cleveland, Ohio. Motion picture films showing porcelain enameling processes in several large enameling plants.

The Foundry Equipment Company, Cleveland, Ohio. Rolling drawer core oven, portable-rack type core oven, vertical conveyor type core oven, and small portable ovens. Photographs of actual installations of Coleman and Swartwout ovens.

General Electric X-ray Corporation, Chicago, Ill. X-ray examinations of castings.

The Globe Steel Abrasive Company, Mansfield, Ohio. Samples and advertising matter of our line of metal abrasives. Globe cornered steel grit and Globe HC chilled shot.

Great Lakes Foundry Sand Company, Detroit, Mich. Molding core, silica and blast sands. Bentonite, molding and clay bonds. Coke, gannister and fire clay.

Great Western Manufacturing Company, Leavenworth, Kansas. Type "V" Combs gyratory foundry riddle. Type "HL" sifter for testing fineness of foundry sands. Type "V-5" Giant Combs gyratory foundry riddle.

R. G. Haskins Company, Chicago, Ill. Flexible shaft, equipment for grinding, wire brushing, polishing and sanding. High speed rotary files for use with above.

The Hill & Griffith Company, Cincinnati, Ohio. Foundry equipment and supplies.

The Hines Manufacturing Company, Cleveland, Ohio. Complete line of flasks of every description.

The Hisey-Wolf Machine Company, Cincinnati, Ohio. Grinding machines, motor driven. Snagging grinders. High speed grinders. Floor stand grinders and portable grinders.

Holcroft & Company, Detroit, Mich. Photographs and drawings. Core and mold ovens. Heat treating and annealing furnaces.

Illinois Clay Products Company, Joliet, Ill. Goose Lake fire clay flour for bonding molding sand. Goose Lake plastic fire clay for furnace and ladle linings and for patching and daubing mixtures. A complete line of foundry refractories, including fire brick and clays, refractory cements, plastics and super-refractories.

Illinois Testing Laboratories, Inc., Chicago, Ill. Portable and stationary indicating pyrometers and bakeometers for temperature measuring of molten non-ferrous metals, core ovens, annealing and heat-treating furnaces.

Industrial Minerals Company, Columbus, Ohio. A complete line of foundry sands for all molding, core and cleaning requirements. Represented by H. N. Rose and W. G. Edwards.

The International Nickel Company, Inc., New York, N. Y. Typical applications of nickel alloy steel castings, nickel cast iron, and nickel-bearing, non-ferrous castings.

The Kelley-Koett Manufacturing Company, Inc., Covington, Ky. X-ray diffraction and radiagraphic equipment for metal inspection. X-ray films and illuminators.

Spencer Kellogg and Sons Sales Corporation, Buffalo, N. Y. Linseed base core oils, cores made with these oils and finished castings.

Kelly Graphite Mills, Inc., Stockertown, Pa. Working exhibit of the application of Faceamol shake-on, parting and spray-on.

The Kindt-Collins Company, Cleveland, Ohio. Pattern shop supplies and equipment. Master aluminum melting furnace. Offset and flat aluminum pattern plates.

H. W. Knight & Son, Seneca Falls, N. Y. Pattern letters and figures, letters and figures for memorial tablets, trade-marks.

H. Kramer & Company, Chicago, Ill. Complete exhibit of brass and bronze ingots including manganese bronze and nickel silver ingots.

Lava Crucible Company of Pittsburgh, Pittsburgh, Pa. Graphite crucibles for brass and aluminum foundries, crucible rest blocks, crucible furnace covers. Linings for crucible, open flame, electric furnaces. Super-refractory furnace cements, brick, tile and special shapes.

Lowe Manufacturing Company, Detroit, Mich. Lowe electric sifting machine. Sump pump.

The Paul Maehler Company, Chicago, Ill. Maehler-Universal unit convection heaters for core and mold ovens, gas and oil fired. Drawings, photos and display of conveyor and kiln type core baking ovens.

Mall Tool Company, Chicago, Ill. Flexible shaft machines for grinding, sanding, metal finishing, rust and scale removing, cleaning, die sinking, and metal pattern making.

Malleable Iron Fittings Company, Branford, Conn. Vibrator table. Full line of vibrators, springless, regular, double attaching head, flask rapper, pot rapper and core rapper types; also sprayers.

J. S. McCormick Company, Pittsburgh, Pa. Foundry facings, core binders, and core wash. Foundry plumbagos, chill coils, chaplets. Blystone mixer, McCormixer, pyramid riddles.

Michigan Smelting & Refining Company, Detroit, Mich. Brass and bronze ingots. Apex bronze ingots, No. 1 yellow ingots, phosphor bronze ingots, manganese bronze ingots and aluminum alloy ingots. Babbitt metals. Solders.

Modern Pouring Device Company, Port Washington, Wis. Complete hot metal handling system, the new electric pouring device, hand operated pouring devices and a combination pouring and sand handling system.

The Monarch Engineering & Manufacturing Company, Baltimore, Md. Simplex oscillating, double chamber, iron pot tilting and stationary, and crucible tilting and stationary furnaces. Core ovens, ladle heater, sand mixers, etc.

National Smelting Company, Cleveland, Ohio. Samples of various grades of pure aluminum and aluminum alloys.

New Haven Sand Blast Company, New Haven, Conn. Sandblast room and dust arrester, self-contained pressure Sandblast barrel, self-contained radial Sandblast barrel, and Royersford tumbling mill.

New Jersey Silica Sand Company, Millville, New Jersey. Samples of our various grades of foundry sand, of highest quality for cores, dry sand and green sand molding.

Niagara Falls Smelting & Refining Corporation, Buffalo, N. Y. Special alloys for the manufacture of non-ferrous castings. Standard brass foundry alloys.

Norton Company, Worcester, Mass. High speed grinding equipment. Alundum grinding wheels. Crystolon grinding wheels.

The S. Obermayer Company, Chicago, Cincinnati, Pittsburgh. Titanite, Stone Mixture for pattern making, etc. Snap flasks, bands, and jackets. High temperature cement. Refractories for furnaces.

Pangborn Corporation, Hagerstown, Md. Automatic sand-blast tables; quick loading barrels, etc. Abrasive separators and washers. Hydro core-knockout. Dust collectors. Water washed air. Sandblast helmets.

George F. Pettinos, Inc., Philadelphia, Pa. Representative samples of foundry sands, plumbago facings, blackings, etc.

Pyrometer Service & Supply Corporation, Cleveland, Ohio. Pyrometers, thermo-couples and other pyrometer accessories and supplies.

N. Ransohoff, Inc., Cincinnati, Ohio. Ideal star return barrel; discharges automatically, separates castings from the stars and returns stars to the barrel automatically.

Reeder Manufacturing Company, St. Louis, Mo. Reeder non-chillable chaplets and brass chill ribs (cracking strips).

The Rotor Air Tool Company, Cleveland, Ohio. Portable pneumatic grinders, buffers, sanders and drills, including the Rotor High Production line of grinders, and the new B-O buffer for buffing, filler rubbing and wire brushing.

Royer Foundry & Machine Company, Wilkes-Barre, Pa. Royer sand separators and blenders in operation. Royer scrap remover in operation.

Ruemelin Manufacturing Company, Milwaukee, Wis. Sanitary sand blast cabinet, sand blast generator, vacuum type dust arrester, direct connected motor driven exhauster fan, sand blast guns, operators' helmets, moisture and oil separators (compressed air), and sand blast nozzles.

The Safety Clothing Company, Cleveland, Ohio. Leather, asbestos and duck leggings. Asbestos, leather, acid and duck clothing. Gloves, mittens, hand pads, helmets, blankets and sleeves.

The Safety Equipment Service Company, Cleveland, Chicago, Philadelphia. Super Drednaut goggles, respirators, masks, safety clothing, gloves, leggings, aprons, safety devices and equipment for all requirements.

Safety First Shoe Company, Framingham, Mass. Safety First Shoes to keep the feet safe from injury.

The W. W. Sly Manufacturing Company, Cleveland, Ohio. Sandblast room, table, mills, dust arrester system, tumbling mills, sandblast accessories and supplies. Several units in actual operation cleaning castings.

The Werner G. Smith Company, Cleveland, Ohio. Linoil and other core oils, and specimen cores made with our oils.

Standard Safety Equipment Company, Chicago, Ill. Industrial safety equipment, especially Guardwell goggles for foundry use, Watters Duo-Pressure sandblast masks, Perks safety washers for grinding wheels, and Steel Grip protective clothing.

Steelblast Abrasives Company, Cleveland, Ohio. Steel shot in various sizes and gradings. Steel grit in various sizes and gradings. Samples of pieces and work cleaned by this material.

Frederic B. Stevens, Inc., Detroit, Mich. Foundry equipment, foundry facings and foundry supplies, and "Jumbo Junior."

Superior Flake Graphite Company, Chicago, Ill. Plumbago. Parting. New core and mold process.

The Tabor Manufacturing Company, Philadelphia, Pa. A complete line of foundry molding machines.

Tottenville Copper Company, Inc., Tottenville, N. Y. Brass and bronze ingots and castings made from same. White metal alloys in pigs, bars and castings.

The United States Electrical Tool Company, Cincinnati, Ohio. Variable speed Gibbs drive grinder, standard direct drive grinders, new line of flexible shaft grinders; some for high speed wheels.

The United States Graphite Company, Saginaw, Mich. Mexican graphite, plumbagos, corewashes, etc., and other graphite products of interest to the foundryman.

Vesuvius Crucible Company, Swissvale, Pa. Graphite crucibles and graphite stoppers.

The Wadsworth Core Machine & Equipment Company, Akron, Ohio. Wadsworth motor driven core making machines, motor driven core cutting off and coning machines; core and bottom plates, including drag plates for Davis Method of molding.

White Brothers Smelting Corporation, Philadelphia, Pa. Brass and bronze ingot metals; casting copper, babbitt metals, solder and manganese bronze.

Whitehead Brothers Company, New York, Buffalo, Providence. Samples of foundry sands and supplies with representative castings.

E. J. Woodison Company, Detroit, Mich. Parting, core, oils, core paste, three-in-one facing, and snap flasks.

Young Brothers Company, Detroit, Mich. Electrically heated test core oven. Model of continuous conveyor type core oven. Coke fired heater for foundry ovens.

Non-Commercial and Educational Exhibits

American Foundrymen's Association
Apprentice Contests.
Sand Testing.

Engineering Schools
Agricultural and Mechanical College of Texas.
Carnegie Institute of Technology.
Cleveland Trade Schools.
Cornell University.
French Foundry School.
Georgia School of Technology.
University of Illinois.
University of Iowa.
Louisiana Polytechnic Institute.
University of Michigan.
Michigan State College.
University of Nebraska.
University of North Dakota.
Ohio State University.
University of Pennsylvania.
Purdue University.
Rochester Shop School.
Rose Polytechnic Shops.

Associations and Societies
American Society of Mechanical Engineers.
American Society for Testing Materials.
American Standards Association.
Foundry Equipment Manufacturers Association.
Gray Iron Institute.
Malleable Iron Research Institute.
National Founders Association.
National Safety Council.
Ohio Foundries Association, Inc.
Steel Founders Society of America.

Government
Bureau of Mines,
Bureau of Standards:
Division of Metallurgy.
Division of Simplified Practice.
Division of Trade Units.

Technical Sessions

The technical sessions of the Non-Ferrous Division were the best attended and most interesting in years. The Division has been very active in its one year of existence since it was organized. It has drawn forth papers of unusual merit. It has initiated a shop operation course which has been an unqualified success. It is laying plans to establish a Research Fellowship at the Bureau of Standards, and is making such a request formally to the Board of Directors of the A. F. A.

W. ROMANOFF
Technical Superintendent, H. Kramer and Company, Chicago, Ill.

The Division is ready to collect data on sand control, but the response to questionnaires has been so poor that the work has been put aside for the present.

The Sub-Committee on Recommended Practice will get articles on various non-ferrous subjects for publication in the A. F. A. Bulletin.

Below are abstracts of the papers read.

APPLICATION OF BRASS INGOT METAL IN INDUSTRY

By Wm. Romanoff and C. O. Thieme

The development of the use of ingot metal from secondary metals has been an economic necessity. Improper foundry practice has been the main cause of most of the troubles arising from the use of both virgin and secondary metals. The ingot metal is made by the refining of sorted secondary metals, which removes the impurities, after which the metal is built up to specification and poured into ingots. The same physical properties may be obtained from properly refined ingot metal as from virgin metal, while considerable saving can be secured through the use of the ingot metal. "Burnt" metal is really a misnomer for brass is not burnt the same as steel. Some of the constituents may be oxidized or volatilized, due to wrong furnace atmospheres or excessive pouring temperatures. An example is shown where standard ingot metal was remelted ten times without change in the physical properties. Trouble can occur in a foundry regardless of what metal is being used.

OVERCOMING ALLOY INGOT TROUBLES IN THE BRASS FOUNDRY

By Wm. E. Paulson

Use of alloy ingot was resorted to in order to meet increasing price competition. A most carefully selected ingot gave castings which presented machining troubles. Specified ingots, without many of the metallic impurities known to be detrimental did not eliminate the difficulty. Finally, ingot metal specially prepared from clean copper scrap and solder metal was secured and production troubles were overcome.

PROGRESS OF DIE-CASTING INDUSTRY

By Marc Stern

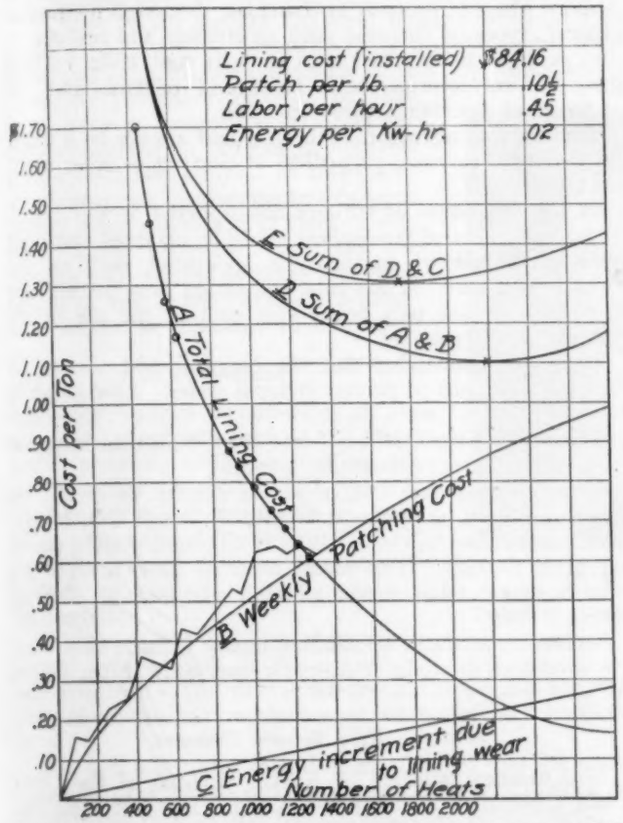
Die casting is defined and its relation to a slush casting, permanent-mold casting, centrifugal casting and pressed casting is carefully pointed out, because of the tendency to confuse some of these terms. Early haphazard alloying methods which were responsible for unstable alloys are discussed, and contrasted with the progress made since the subject received scientific investigation. On the subject of dies, the importance of gating, venting and water cooling is pointed out. Air and plunger types of casting machines are illustrated, and progress traced up to the modern automatic casting machine capable of producing even complicated die castings at the rate of over seven operations per minute.

MARC STERN
Manager, Die-Casting Division, A. C. Spark Plug Company, Flint, Mich.

CARE AND MAINTENANCE OF FUEL-FIRED FURNACE LININGS IN THE NON-FERROUS FOUNDRY

By H. E. WHITE

The discussion of refractories is divided into two sections, one on the open-flame furnaces and one on the non-ferrous melting cupola. The open-flame furnaces are listed as (1) vertical barrel type, non-rotating; (2) horizontal barrel type, rotating, and (3) egg-shaped tilting type. Data secured in 1926 and 1929 surveys are compared; these show a decrease in use of fireclay refractories and an increase in silicon-carbide and the alumina-



Curves for Computing Economical Limits of Furnace-Lining Maintenance. As Lining Gets Older, More Energy Is Required to Melt Same Amount of Metal—Plotted on Curve C as a Conservative 3 Per Cent Increase. Other Conditions Being Equal, Most Economical Point for Lining Renewal Is Flat Part of Curve D, the Sum of Curves A and B.

silica, mullite and aluminum-oxide types. Causes for failure are analyzed. While these causes are numerous, spalling and improper furnace atmospheres are two of the most important. Types of available lining materials are listed and discussed. Proper installation is stressed, drying and glazing being of special importance. Factors conducive to long life are listed as follows: Proper installation, thorough preheating, proper glazing before using, daily inspection, hot patching when needed, weekly cold patching and the use of mild cleaner to remove accumulated slag.

REFRACTORY CEMENTS IN THE NON-FERROUS FOUNDRY

By H. E. WHITE

The desired properties of refractory cements are said to be elasticity; mechanical strength; high softening point; resistance to abrasion; low shrinkage; resistance to disintegration, slagging and spalling; long vitrification range, and workability. Specifications, if furnished, would be of considerable assistance in securing proper material; data for such specifications are given. Some 49 different brands of cement were studied in the preparation of this report. These are discussed under such groups as fireclay-silica ganister, silicon-carbide, alumina and alumina-silica, and kaolin-clay combinations. Data secured in 1926 and 1929 are compared, and these show that the so-called super-refractories are on the increase. Application of the different cements to various uses are discussed.

STRONGER ALUMINUM CASTINGS BY IMPROVED FOUNDRY PRACTICE

By T. D. STAY, E. M. GINGERICH and H. J. ROWE

This paper discusses those factors of aluminum founding which must be studied carefully in order to get the best qualities in aluminum castings. Variables in foundry practice which affect the strength of castings and which are reviewed in detail are: (1) Melting of metal; (2) Pouring temperatures; (3) degree of chill imparted to the metal by kind and temper of sand; (4) path taken by metal through the mold after leaving the gates, and (5) rate of solidification in the various sections of the castings. An investigation was carried out which showed that test bars attached to castings did not give the correct information regarding the actual properties of the castings. Radiographic examination of castings provides a valuable means of improving foundry methods to secure better castings. Pattern design should be studied, as changes often can be made to improve soundness and strength. Frequently pattern design for other metals should be changed when to be poured of aluminum. A study of core design also is important. Careful control of molding sand properties is advocated, as an ideal sand for aluminum is one which combines high permeability, compressive strength, durability and fine texture. Low permeabilities and low green strength are the cause of many failures. Gating, use of chills and risers all affect shrinkage, cracking and hot shortness. Care must be exercised to prevent contamination of the metal in melting, and to secure proper pouring temperatures and pouring heights.

ROUND TABLE DISCUSSION

A round table luncheon was held on May 15th with H. M. St. John, chief metallurgist of the Detroit Lubricator Company and associate editor of THE METAL INDUSTRY, as chairman. This meeting was extraordinarily well attended and the discussions were of the livest and most informative character. The subjects and conclusions are given below in the order in which they were taken up.

1. **The effect of sulphur in bronze castings.** It seems that sulphur should be under 0.07 to be harmless. Over 0.1 is definitely harmful, although some mixtures like 80-10-10 can carry more than others, like the 85-5-5-5. The effect of excessive sulphur is porosity, causing iridescent holes in the castings and sluggish metal.

Sulphur can be removed by oxidizing the melt, but this causes losses at the same time of tin, lead and zinc.

2. **Fluidity of brass as brought about by phosphorus conditions.** Phosphorus is a useful deoxidizer but causes trouble, if present to excess, in the form of sluggish metal and castings with a dirty surface. In amounts up to 0.005 phosphorus is not harmful but over that it is likely to cause the zinc to appear on the surface of the castings. The higher the zinc content of the alloy, the less phosphorus can be used.

3. **Differences between metals melted in the crucible open flame and electric furnaces.** This question is difficult to settle without a uniform test bar

which can be made from different melts allowing for a fair comparison. Some opinions were expressed however, to the effect that electric furnace metal resulted in somewhat higher tensile strength and elongation than the other types.

4. Crucibles versus lined steel shells for pouring off from furnaces. Crucibles are generally found to be excellent but the temperature drop in a crucible full of melted metal is large, in some cases around 40° to 50° per minute. The lined ladle, using an insulating shell, can be held to 20° per minute.

All ladles and crucibles build up with metal and slag. In order to eliminate this material, the pot or ladle can be heated up and the accumulation melted out, either with or without the use of a flux such as fluorspar or fused soda ash. Care should be exercised in using the soda ash as it corrodes the crucible rapidly.

It is best to scrape and clean the crucible or ladle after each pouring in order to keep the metal clean. In the case of a reverberatory furnace this is more difficult but the fluffy material can be blown out with compressed air and the hardened slag, etc., fluxed out with fluorspar.

5. Barrett brass melting cupola. The cupola furnace for melting brass was made possible by the development of a purer fuel by the Barrett Company of New York. This fuel is a coke derived from coal tar pitch. The furnace is operated like the cast iron cupola. A bed of incandescent fuel is built up and the metal charged directly on it. Alternate layers are charged into the furnace, of fuel and metal, all the way up to the charging door. This fuel is very high in fixed carbon, and has a very high compressive strength. It contains about 0.3 sulphur, about 0.45 ash and about 99.25 carbon. It produces about 14,900 B T U per pound.

The melting zone is lined with a high refractory. The shell has an insulating lining between the refractory and the fire brick. The fuel bed is 26″ to 42″ thick depending upon pouring temperature desired, as the higher bed gives the higher temperature. Air volumes and pressures also vary directly as the pouring temperatures desired but a commonly used proportion is about 350 cu. ft. per minute at ½ to ¾ pounds pressure.

When secondary metals are melted, the excessive slag produced can be drawn off from a special tap between the tuyeres. A lot of 500 to 600 pounds of turnings can be run down in 8 to 12 minutes including the charging time; ingots and heavy scrap would take 3 to 6 minutes longer. The fuel ratio is about 1 pound of fuel for 15 to 19 pounds of metal.

The furnace can be run on individual heats and taps like the cast iron cupola, or it can be run continuously by keeping it charged full.

The metal recovery varies inversely with the zinc content. In the case of the 85-5-5-5 alloy, the 80-10-10 alloy and the 88-10-2 alloy, metal recoveries ranged from 95 to 97 per cent. The metal recovered was uniform, close-grained and had good physical properties. Good pressure castings were made from a lot of 1200 pounds of grindings which contained 12 per cent non-metallics.

The use of this cupola furnace permits more scrap in the melt as the process, it is claimed, has a cleaning action on the metal, removing such impurities as iron and aluminum.

High zinc content alloys cannot be economically melted in this furnace as the losses are very high. The zinc oxide can be recovered in fume arresters. Experiments are being run on the possibility of using the recovered zinc oxides.

SHOP OPERATION COURSE

The shop operation course was held in three sessions. It was altogether practical in character and although it was suitable for even the beginner in the brass foundry, it was noticeably attended by a large number of older and experienced men.

Fuel Fired Furnaces

This meeting, with E. R. Darby, chief metallurgist of the Federal Mogul Company as chairman, discussed melting in general; types of furnaces such as crucible and reverberatory or open flame; fuel used such as coal, coke, oil and gas; the refractories, acid, basic and neutral, and the methods of operating these furnaces.

The meeting agreed that there would always be a place for fuel-fired furnaces regardless of electrics or other modern types.

In the discussion of furnace atmospheres, it was stated that a truly neutral atmosphere could be obtained and held only by the use of gas analysis apparatus, such as the Orsatt apparatus. A gas tube is inserted near the surface of the metal, this tube being kept cool by the use of ice water in a water jacket.

It was recommended that the metal should always be covered with coke to protect it from gases. Low sulphur coke and fuel oil must be used.

The air line must be kept free from pulsation in order to keep the burners operating steadily.

It was stated that CO_2 gas was neutral to metals in general, but not to zinc as it formed ZnO and CO. Moreover, precautions had to be taken at all times, even in pouring after melting. The metal must be kept covered as even a strong wind would affect it adversely if allowed access.

No better metal can be obtained in any furnace than with the coke-fired crucible, if properly operated. Most fluxes are unnecessary.

Induction Type Electric Furnaces

This meeting was led by R. W. Parsons of the Ohio Brass Company of Mansfield, Ohio. He discussed the heating principles of the induction type furnace, particularly the Ajax-Wyatt. Operating data for this furnace was given. Units are obtainable in sizes from 30 to 40 KW holding from 300 to 2200 pounds per heat.

Power used is single phase, 60 cycle, AC with 200 to 450 volts. The power factor is from 70 to 80 per cent; 8 pounds of metal are melted per KWH or 250 KWH per ton. The total power required, including hold-over, is 375 KWH per ton. Melting rate is about 3 hours per ton for a 600 pound furnace. The average operating cost based on a five-day week and a nine-hour day, with power at 1.67c per KWH, is $8.84 per ton, not including depreciation and interest on investment. Metal losses vary from ¼ to 1 per cent.

Indirect Arc Electric Furnaces

This session was headed by D. E. Broggi, Neptune Motor Company, Long Island City. Those present discussed the present status of the indirect arc furnace in the foundry, showing the types of indirect arc furnaces, melting costs including losses, and methods of operation, such as charging, controlling the arc, regulating the furnace, controlling slags, using fluxes, etc. The types of mixtures suitable for this furnace were pointed out, such as brass, bronze, aluminum, high nickel alloys and Monel metal.

Deep-Etch Test of Brass

A Rapid and Simple Method of Testing Brass Castings for Soundness—Part 1.

By W. F. GRAHAM and L. A. MEISSE

Technical Division, The Ohio Brass Company, Mansfield, Ohio

FROM A PAPER READ AT THE CLEVELAND MEETING OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION, MAY 12-16, 1930.

INTRODUCTION

THE investigation of ferrous metals by means of so-called deep etching and subsequent micro-examination of the surface has been applied extensively in recent years. In the literature there may be found well-illustrated examples of the results of this test, as shown by Keshian,[1] but there seems to be little work done in its relation as a tool for the uncovering of defects in non-ferrous metals and alloys. In this paper it is attempted to describe briefly some typical results obtained in deep etching these latter materials, especially the brasses and bronzes to bring out more clearly defects in the metal which otherwise would be invisible to the naked eye.

W. F. GRAHAM

Technical Department, Ohio Brass Company, Mansfield, Ohio

Test Procedure

Deep etching is accomplished by the attack of reagents which will react rather violently with a smooth surface of the metal or alloy. The reagents tend to eat away the points or areas of discontinuity of the structure, which may be caused by sonims, crystal boundaries and, in certain materials, by dentrites.

In general, the clean metal as represented by the mass of the crystals is not attacked. The degree of the attack of the reagents will, of course, vary with concentration, time and temperature.

The test procedure should be so adjusted that the attack does not progress to such an extent that the results of the differential etch of the inclusions is over-emphasized. It is the object of the test to reveal the presence of inclusions; and, after they have been revealed so that they are visible to the eye or under low magnification, there is no further need of developing them by continued etching.

The actual mechanics of the attack may be explained by the common electrolytic theory of corrosion in which there is a couple set up between the dissimilar constituents in the matrix.

In the case of nonferrous alloys, the etching attack may proceed on dissimilar constituents which may be forced out at the grain boundaries. In all cases, however, in the application of this test the body of the crystal, even though composed of a solid solution of a cored nature, will be in a slight relief to that of the grain boundary. The grain boundary will be traced slightly by the etching reagent and if there are no inclusions the specimen will have the appearance of a mass of clean bright crystals.

APPLICATION OF DEEP ETCHING TO RED-BRASS ALLOYS

Our application and experience with deep etching has been confined chiefly to investigation of the structure of cast red brasses, that is, alloys containing copper, tin, lead and zinc of the approximate composition 85-5-5-5 and variations thereof. We have, however, applied the method in some cases to yellow brasses, phosphor-bronzes, gun metal and some special nonferrous alloys, and the results which we obtained were very satisfactory.

Reagents

It would seem that the proper etching reagent to use on red brasses is nitric acid. Nitric acid attacks the alloy violently, generating a considerable amount of heat. For this reason the action is a very quick one and the test can be accomplished in a very short time.

In the use of concentrated nitric acid alone it was found that the tin, particularly when over two per cent, was oxidized to meta-stannic acid. This insoluble coating promoted a differential attack which was misleading.

In order to overcome this difficulty, 10 per cent of hydrochloric acid was added to the etching reagent, thereby keeping the tin oxide in solution and thus resulting in a clean surface on the specimen.

Procedure

The actual procedure in etching a given specimen depends somewhat on its size and shape, but for specimens not greater than 3 in. square and ½ in. thick, we have found that an 8-minute immersion in a solution of nitric acid (1.42 spec. grav.) with an addition of 10 per cent by volume of hydrochloric acid (1.18 spec. grav.) gives, in general, a very satisfactory etch.

The method can be varied and used to investigate the structure of quite large specimens by means similar to those used for the whole surface of steel ingots. Etched surfaces which have tarnished can be brightened by washing in chromic acid.

This paper will be concluded in an early issue—Ed.

[1] Deep-Etch Test for Iron and Steel. Trans. American Society for Steel Treating, vol. xii, p. 689 (1927).

Wiping Solder

Q. What is a good wiping solder for automobile body work?

A. A wiping solder suitable for use in automobile body work or with other parts which, after soldering, must be enameled and subjected to a baking operation, has the following composition:

Tin	24.50—25.50%
Lead	75.00
Antimony (max.)	0.12
Copper (max.)	0.08
Zinc	None
Aluminum	None
Other impurities (max.)	0.10

—H. M. St. John.

Material Costs in Finishing

An Analysis of the Cost of Materials and Supplies Used in Metal Finishing

BY C. VAN DERAU

First Vice-President, American Electroplaters' Society

FROM THE MONTHLY REVIEW OF THE A. E. S., FEBRUARY, 1930

DURING the past score of years, there has been a vast change in the field of electroplating. The most outstanding change is the effort of the electroplater to master the technical side of his profession through home study, night schools, and group study of chemistry, as fostered by a large number of our Society's branches.

However, as we progress with the technical study of the basic fundamentals of plating, we find that our employers, while interested in our endeavor to better our knowledge, are even to a greater extent interested in our ability to apply our newer knowledge to the handling and training of men under us, and in our ability to line up more modern equipment to obtain a better product at a lower cost. Their opinions to a large extent are based on the overall cost of our product, and on the comparison of our finishes with what our competitors are offering to the customer.

Productive labor and department overheads are generally known to the electroplater, but finishing material costs are, as a rule, left up to the accounting department to allocate as they see fit, generally placing this item of expense in a separate overhead, or in a general factory overhead.

When the electroplater is asked the question, "What difference is there in the material costs of nickel-plating and a lacquer finish?" the average electroplater cannot give that difference for the reason that he does not know, and will refer the question to the cost department, which is, as a rule, as ignorant of the right answer as he is.

Many times an article that is being made at a profit, becomes unprofitable by simply changing the finish, due to the difference of material costs.

The purpose of this paper is to show a joint method worked out by the engineering, cost, and finishing departments at our plant to control the all-important item of expense materials of plating.

For several years the accounting department carried material costs as a percentage on flat labor costs of polishing, plating, buffing, enameling, painting and lacquering. With this method in use, a percentage of 25 per cent of the flat labor covered the material costs. With the installation of automatic polishing and buffing, and the conveyorizing of the finishing departments, it was found that the 25 per cent went to 35 per cent within a year. Over a period of several years the 35 per cent went to 43 per cent to as high as 120 per cent of the flat labor in these departments.

For the above reason, it was necessary to work out a better method of accounting for this item of expense. The engineering department figured the area of all parts finished and noted this on their drawings. They also adopted this as standard practice for the future. The cost department secured the total number of parts or complete units manufactured during the year of 1927; the finishing department made up a list of all material used during the year of 1927, after which the cost department extended the costs of each item including transportation charges.

From this list the various items were segregated under their respective columns, such as nickel copper, chromium, lacquers, etc., and added together for a total material cost of the various finishes. Acids and cleaners presented a problem in allocating the proper share to the various finishes.

By taking the area of a finish and dividing by the total area of all finishes in which these cleaners were used as a part of the process it was easy to determine what percentage belonged to each finish. This cost was added to the cost of the various finishes.

RECAPITULATION OF PLATING MATERIAL

	Nickel	Copper	Cadmium
Regular materials	$18,312.51	$1,200.41	$1,927.83
Cleaners	6,520.06	1,811.13	543.34
Cyanides	.....	4,270.18	991.49
Turpentine	21.58	.....	.....
Wax	72.41	.....	.....
Copal Varnish	.....	.....	.....
Caustic Soda	.....	38.32	.....
Gasoline	.....	.....	.....
Totals	$24,926.56	$7,520.04	$3,462.66

Item	Chromium	Aluminum Bronze
Regular materials	$633.50	$954.38
Cleaners	181.11	.....
Cyanides	.....	.....
Turpentine	.....	.....
Wax	.....	.....
Copal Varnish	.....	657.78
Caustic Soda	.....	.....
Gasoline	.....	172.10
Totals	$814.61	$1,784.26

RANGE BAKING JAPANS

Items	Quantity	Cost	Total Costs
Range Enamel	4,070 Gal.	$1.10	$4,477.00
Range Touch-up	29 "	4.00	116.00
Primer Coat	62 "	2.00	124.00
Varneline	2,040.5 "	.215	438.71
Grand Total			$5,155.71

SWITCH JAPANS

Items	Quantity	Cost	Total Costs
Swich Enamel	3,087 Gal.	$ .75	$2,315.25
Switch Touch-up	103 "	3.00	309.00
Varneline	2,040.5 "	.215	438.71
Grand Total			$3,062.96

SLATE BASE LACQUER

Items	Quantity	Cost	Total Costs
Black Lacquer	355 Gal	$2.45	$869.75
Rubber Finish	66 "	4.00	264.00
Lacquer Thinner	421 "	1.55	652.00
Grand Total			$1,785.75

SUMMARY OF MATERIAL COSTS OF VARIOUS FINISHES

Finishes	Cost in Dollars	Area in Sq. Ft.	Cost Per Sq. Ft.
Nickel	24,926.56	1,497,090	.01665
Copper	7,520.04	353,923	.02068+
Aluminum Bronze	1,784.26	219,396	.00813+
Bronze and Lacquer	8,816.94	308,944	.02853—
Cadmium	3,462.66	100,000	.03462
Chromium	814.61	30,822	.02640
Range Paint	5,155.71	1,765,654	.00292
Switch Paint	3,062.96	978,582	.00313
Slate Base Lacquer	1,785.75	135,126	.01320
Vitreous Enamel 1 ground coat on 2 sides			.008
" " 2 white coats on 1 side only			.020

From the above figures, it is apparent that deposits from cyanide solutions cost more per square foot than deposits from acid solutions, due, no doubt, to the fact that all sulphate solutions are soluble in water, whereas the metal cyanides require sodium cyanide and water.

Over a period of time considerable sodium cyanide is required to maintain a workable solution. Inert salts of carbonates also increase material costs of cyanide solutions.

Lacquer enamel costs more per square foot than vitreous enamel when it is necessary to apply three and four coats to obtain a comparable finish. This, no doubt, is due to the fact that water is used as a vehicle for vitreous enamel, whereas alcohols are required as vehicles for lacquer enamel. In either case, the vehicle is evaporated into the air, and the difference in costs is the price of water as compared to the price of alcohols.

The above method of figuring material costs has been applied for the past one and one-half years, and has proven entirely satisfactory.

Now the reason for using 1927 figures was that we didn't want to give out information of that kind until we had a chance to prove up on those figures.

Now, at first, one is inclined to think that it takes a tremendous lot of work to find out what material costs are. As a matter of fact, it does take a tremendous lot of work for a few weeks on the part of some one man to gather up this data, and do the dividing and calculating that is necessary to get the right answers. In all plants the material costs will vary. For instance, the cost in our plant that is .02 per square foot may only be .015 in another, or it may be .025. Now the reason for that is that it depends on your standards and the amount of plate that you are putting on your product. The average thickness of the nickel deposit here is approximately .0005. We have a lot of parts in which we put .001. We have other parts that we only need to put on .0002 and .0003. So, taking that average of approximately .0005, these figures will cover that condition. So you can readily see that, if you use those figures in your own plant, you will have to determine on just about what your average thickness of deposits was in order to find out what the approximate cost of material is.

Now that is an important thing, particularly in job shops. I spent fifteen years in job shops, doing all kinds of work, all classes, and I know of months where we had a tremendous lot of business, worked overtime, added as many people as we could hire, and yet at the end of the month, we came out just about even, and sometimes would go into red figures on our ledgers, and we wondered why. As a rule the Board of Directors of that company would get together, and being in charge of plating operations I generally got panned because we didn't make any money for that month. Now I can look back today and see that during some of those months when we didn't make money, it was due to the fact that we changed over possibly from long runs of nickel plating to lacquer coatings, and our overhead as it was set up was not large enough to take in the additional expense of lacquers as against nickel plating. The only thing that was in our favor, and is in most jobbing plants' favor, is that we might have a month of that run and then it would turn back again. And it is a darned good thing, because there would be more companies going broke, or they would have to find some means of getting this all-important item of expense under control.

Now as a word of explanation as to why the change from 25 per cent to as high as 120 per cent. That method of accounting was all right for a period of time, as long as operations in the plant were constant. I mean by that that if we were doing hand polishing, plating in there, almost any old style, but the same day after day, buffing, hand buffing, we would have approximately so much flat labor day after day or month after month, and a cost accountant could take that and proportion these expense materials in such a way that he can carry a percent. When we take an article like a toaster and take out our cost of polishing and flat labor by hand, 15¾c, and by putting in a $15,000 polishing machine we reduce that cost to 6c, where did this 25 per cent go on changes of that kind? When we take an iron and reduce our labor cost from 25c to a little less than 10c, by automatic equipment again the 25 per cent grows out of proportion. So that's the reason why this has been absolutely necessary in our plant to bring material costs under control.

DISCUSSION

Roger S. Sperry: Mr. Van Derau states a certain price per square foot for lacquer enamels. That is probably correct on a perfectly flat sheet of material, but if he is spraying an odd shaped piece, he is going to lose a lot of stuff because it won't hit the article. And some shapes will lose a great deal more than others. Does he consider that?

Mr. Van Derau: Yes, that was considered. On articles such as a Cozy-Glow Heater, you have all kinds of shapes there. You have an arm that this reflector is mounted in, and you have a round base. It is all spraying, and we are subject to those losses. Now if we took a lacquer only on a reflector part, and particularly inside where we have less loss from mist than we have on the outside or on these small parts, then we would refine our cost down to individual parts. That is taking over one year's time on that line of work, and gives us an average for that class of work.

I might say this in regard to that lacquer, that is a thing that depends entirely on the class of lacquer used. Now with these bronze lacquers and clear lacquers, our first inclination was to indicate a cost for the clear coating and for the bronze. On the other hand, as we looked into the future, in the next couple years we couldn't see any articles coming through that were going to differ to any great degree from what we were already turning out. It would be foolish for us to waste a lot of time and complicate the accounting system as well as add red tape in that particular section, so we simply took the average for that class of work.

Here is another point. All of those figures carry a 5 per cent safety factor to take care of market conditions. For instance, as you know, nickel salts in 1929 were higher than in 1928. Now, taken from the year, 1928, in which these costs were applied, we came out with a slight surplus, probably 6 per cent. We added 5 per cent on our cost ledgers to take care of that, so we came very, very close to the cost as they were established over the previous year. This year, I wouldn't be surprised to see a deficit in the accounts of 2 per cent or 3 per cent due to the rise in price of certain materials that have entered into it.

Now if we recheck these figures each year, or each month, that would be a tremendous lot of work and wouldn't be worth the expense. But as against the percent method I will tell you that those accounts represented, without the vitrous enameling account, a total of approximately $82,000, and when you have a $20,000 or $30,000 deficit in your method of accounting, that has got to be taken care of. If we can keep that within a few hundred or even a thousand dollars, our accounting section is perfectly well satisfied, and to anyone familiar with accounting methods in manufacturing plants there are a lot of things that happen in the accounting department that we can't get by with in the shop.

Mr. Williams: I would like to ask Mr. Van Derau about the measurement of plated surfaces. For instance, for a piece 12x12, do you count both sides or only one side, or the exposed sides?

Mr. Van Derau: Both sides. For instance, if it is a toaster, it is finished on one side, white nickeled one side and buffed nickel on the other. Now, if it is a box, a heater box that goes under a hot plate, it is finished in white nickel, but it has approximately half a thousandth because it has to stand up against a certain amount of corrosion and it has to stand in all kinds of warehouses before the customer gets it, so there is very little difference between the amount of nickel on that part and on the ring that is on top of it or the platform. So the area is figured on both sides. Now, in pipe, that is, only one side because you don't plate the inside of the pipe; only a very small amount at the ends. Take wire goods for instance, that go inside of an oven. Those are figured on the surface. When you take the whole line, you only have a half dozen of those items you have to rule on.

It is a good deal like the cleaner solution. It was easy to take the list of materials, that is, nickel salts, boric acid, and nickel anodes, they all went in the nickel solutions; they didn't go into copper or cyanide solutions. There was no question where they belonged. But when we tried to figure out how much cleaner we used on nickel that was another problem and we scratched our heads a few days before we got this idea that the average condition in cleaning was approximately the same whether it was for nickel or for copper, and not a whole lot different if it was for chromium; a little better job and a little more thought given and more care given by the operator for chromium, but as far as the ingredients of the cleaner were concerned, there was very little difference. So we hit on the idea of percenting out. If we had 1,000,000 square feet total and 500,000 feet of it was nickel, then 50 per cent belonged to nickel, and so on down the line.

Oscar Servis: Within what per cent of accuracy do you suppose you have reached your conclusions?

Mr. Van Derau: Within 1 per cent on 1928.

Mr. Servis: Haven't you taken into consideration the electrical energy and overhead expense and all that?

Mr. Van Derau: Don't get the department overhead conflicted with material costs. We carry that two ways. Now, for instance, on our flat labor, it is not a difficult job to find out how much power is being used in any section of the plant, and no two departments use the same amount of power. In the iron finishing, for example, 485 horsepower is used on the equipment that is on that floor. How many men are in it? About thirty or thirty-three men, I think, was the man power of that section, turning out around 40,000 irons per month. That varies. We put it on a daily basis, and it is 42,000 one month and 38,000 the next due to different working days in the month. In other words, to get an average per day. Now the overhead of that department is certainly greater than the assembly department where they may only have 10 horsepower on the whole floor, running a few riveting machines or something of that kind, or 20 horsepower. So that has been taken care of by the works engineering department, who have proportioned out the power used over the various departments, and each department carries its own overhead.

Now the supervision, the amount of inspection, production clerks, labor of that kind, indirect labor, goes into a direct overhead.

Mr. Servis: You wouldn't include power energy in overhead; that would come in material costs.

Mr. Van Derau: That would come in the general overhead; the material costs are only the materials.

Here is what generally happens in materials. It is one of the reasons that many times an item can be an unprofitable line, yet it is not known. For instance, I gave you the example, a range leg. Today there are a good many companies coming around plants that are making ranges and trying to get back some of the business they used to have in the range industry in the way of black baking japans which they have lost to vitreous enamels. I don't blame them a bit for doing that, but they are coming with lacquer enamels, some of them as low as $2 a gallon, and suggesting to the manufacturer of ranges that he use these baking color japans or lacquer japans by putting on a baking primer and putting one or two coats of a colored lacquer on top of such parts as switch covers and parts not subjected to heat, like the legs, so that he will be able to lower his cost. Now here is what actually happens. We know it is going to take three coats of lacquer to give us a good job on a comparative vitreous enamel. But when we take the actual cost of lacquer and try to offset that against vitreous enamelling, it can't be done. Thirty cents as against 18c is the way it works out on one range leg. Now if we left the material out and proportioned that in a general overhead, all over the plant, then that would become a little bit on the assembly section, a little bit on the screw machine section, and so on, and we wouldn't know what our material costs were, and we could kid ourselves and say that this painted leg is much cheaper than the vitreous enamel. As a matter of fact when you get down and take 100 or 1,000 of those legs and put them in lacquer and actually measure that amount of material, and take the same amount and put them in enamel and actually measure the difference, you will find that it lies in the fact that alcohols cost money and you only evaporate them in the air, and water is very, very cheap. And that is the real difference. Gallon for gallon, vitreous enamel against lacquer, it is within line. There may be 50c or 75c difference, but there isn't a lot of difference in the base cost of those materials to start with.

Polytechnic Institute of Brooklyn

Polytechnic Institute of Brooklyn, N. Y., will celebrate the completion of its seventy-fifth year on June 17th and 18th.

The seventy-fifth annual commencement will be held on June 18th. First honorary degrees in the history of the Institute will be conferred on Admiral Richard E. Byrd and Professor Karl Compton, president-elect of Massachusetts Institute of Technology.

Correction

On page 212 of our May issue, the author of the article "A Special Bronze Casting Problem," was given as Joseph M. McGinnis, E. R. Caldwell and Son Brass Company, Syracuse, N. Y. This was incorrect; Mr. McGinnis is not connected with the E. R. Caldwell firm.

THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

Member of Audit Bureau of Circulations and The Associated Business Papers

Published Monthly—Copyright 1930 by The Metal Industry Publishing Company, Incorporated; Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress, March 3, 1879

SUBSCRIPTION PRICE, $2.00 Per Year. SINGLE COPIES, 20 CENTS. Please remit by check or money order; Cash should be Registered. Advertising Rates on Application. Forms Close the First of the Month.

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Address all correspondence to The Metal Industry, 99 John St., New York. Telephone, Beekman 0404. Cable Address Metalustry.

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Editorial

The Electroplaters' Convention

THE 1930 convention of the American Electroplaters' Society will be held in one of our beautiful American cities—Washington, D. C. The visiting members and their friends will be treated to sightseeing which they have never had before, from a standpoint of beauty and historical interest. A convention in the Capital is sure to be inspiring even to such a business-like group as electroplaters and electrochemists.

It is of no small interest that in this city is being carried on some of the most important electroplating research in America. The Bureau of Standards, internationally known for its research in physics, chemistry and metallurgy, is working side by side with the American electroplating industry and its foremost technical organization, the American Electroplaters' Society, to raise electroplating to the plane where it deserves to be—that of an industrial science and not merely a trade. At the same time, this results in turning electroplaters into technicians instead of merely skilled workers.

Washington is not an industrial center, naturally enough. It is noteworthy, however, that the Baltimore-Washington Branch of the American Electroplaters' Society is one of the flourishing branches. The combination of a business center like Baltimore and a research center like the Bureau of Standards in Washington is good enough to keep this branch of the Society in a strong position.

The program for this convention, as published on pages 265-6 of this issue, is full of important papers. No plater who can possibly attend has the right to miss it. No manufacturer has the right to keep his plater from going. It will be an excellent investment for any firm to send the plater to the meetings, paying his expenses in full. The company will get generous dividends in the report which the plater will bring back—on the papers he will hear, the exhibits he will see, and the information he will gain through informal talks with other platers from all parts of the country.

One more injunction. Everyone who travels to Washington should obtain a reduced fare certificate. Last year the total was only 25 below the necessary number to get the reduction. Let no one neglect this simple duty this year, and the membership as a whole will benefit to the extent of thousands of dollars.

The Foundrymen's Meeting

THE Cleveland meeting of the American Foundrymen's Association reported on page 280 of this issue sets a mark for all others to aim at. Over 7,000 members and guests registered, 249 firms exhibited, and 84,000 square feet of floor space were taken. All of these are new records. In addition, there were new records in the "intangibles" for which no figures can be given—namely the interest evinced in the papers, the liveliness of the discussions and the attendance at the technical sessions. The whole convention showed the work of an excellent organization functioning smoothly.

One institution showed special progress—the Round Table. The Round Table luncheon on non-ferrous metals was the biggest ever held and the liveliest. Every subject brought out opinions, counter opinions and facts. There is no question that this type of meeting, which was an innovation only a few years ago, is now firmly established.

The American Foundrymen's Association is to be congratulated, as is also the Non-Ferrous Division, for the outstanding results achieved at the 1930 convention.

Importance of Pure Metals

IN this issue are published abstracts of two papers, read at the American Foundrymen's Convention and seemingly opposed in viewpoint, "The Application of Brass Ingot Metal in Industry," by Romanoff and Thieme, and, "Overcoming Alloy Ingot Troubles in the Brass Foundry," by Paulson. In the former we have the ingot maker pointing out that any metal, remelt or new, can be spoiled by improper handling in the foundry and that a secondary ingot properly refined gives excellent results at a considerable saving in cost. On the other hand, we have the experience of the foundryman using ingots which caused machining troubles and gave castings of poor appearance. What is the answer?

The core of this question is in the words "properly refined." Any metal or alloy, regardless of its source, if properly refined, gives good results in the foundry. The value of a metal is in direct proportion to its purity. Virgin metals containing practically no impurities, obviously contain nothing to cause trouble in the foundry and machine shop. Secondary metals which may contain all kinds of impurities must be carefully treated to elminate the harmful ingredients. If they are removed, the secondary metals are fully equal to new metals; if not, the quality of the secondary ingot is low. Obviously, the high grade secondary ingots must be more expensive than the low grade alloys.

Another industry recognizes this fact even more clearly than the brass foundry. Die casters know that even a fraction of a per cent of tin in their zinc base alloy will cause trouble. They also know that the zinc should be of the highest possible grade or their castings will not stand up. Brass foundries should recognize just as clearly the importance of purity in their alloys. They should also recognize, at the same time, the fact that it is expensive to purify secondary metals. They cannot expect to buy high grade ingot at the bottom market price.

We hope that the work of the Special Committee for the Promotion of the General Use of Specifications for Copper Alloys in Ingot Form, of the American Society for Testing Materials, which is working on this problem in co-operation with the Non-Ferrous Metal Institute, will bring this point home to foundrymen and ingot makers so that the much argued question can be seen in its truly simple elements. The value of a metal depends upon its purity.

Melting Brass in the Cupola

FUEL fired brass furnaces have been in existence for over 6,000 years. The crucible is one of our oldest industrial devices—and it is still with us, deservedly. It was stated in no uncertain manner at one of the meetings at the recent foundrymen's convention in Cleveland that no better metal was obtainable in any furnace than crucible metal, properly handled. Regardless of modern developments, open flame furnaces, reverberatory furnaces and electric furnaces, there will always be a place for the crucible.

But now we have a new member of the fuel fired furnace family—the cupola. It seems that a number of installations have been made in which this method of producing metal for ingots or castings makes astonishing records for speed and quality of product. The high speed is to be expected; the quality is of great interest to foundrymen because this point was originally questioned. Zinc losses are naturally higher than with other types of furnaces, so far restricting the cupola to the low zinc bearing alloys.

Foundrymen and alloy producers will watch with continued interest the race between crucibles, reverberatories, cupolas and electric furnaces for the post of leadership. Regardless of which type "wins," none of them will lose, as there will always be a place for every type of furnace under the widely varying conditions which must obtain in the metal melting and casting industry.

Convention Season

THIS is the time of the year when we are all busy. In a normal year business is brisk and we are busy taking orders and getting out shipments. In a poor year we are busy trying to find business. But in any year, good, bad or indifferent, at this season we are busy attending conventions.

In this issue we have reports of the conventions of the American Foundrymen's Association and the Electrochemical Society. We have an advance statement of the coming meeting of the American Electroplaters' Society; these meetings interest our readers especially. But there are many others going on, such as the American Society for Mechanical Engineers, the American Chemical Society and the Society of Automotive Engineers. Shortly there will be held a meeting of the American Society for Testing Materials.

What does all this activity mean? It means that regardless of dull times, the industry of the country is always active, developing new products, improving methods, searching for ways to overcome its difficulties and solve its problems. There is no relaxing of effort Progress must go on.

And that is why dull times cannot last, no matter how bad they may seem. Business is always dull for the slacker and the sluggard. Business is occasionally dull with the active and alert—but not for long. American industry is on its way upward.

Business Conditions

REPORTS on business conditions are always too late to be of practical value in the immediate emergency. By the time they are published they represent hindsight rather than foresight. Nevertheless, it is our only way of attempting to gauge the future.

According to the Federal Reserve Bank of New York, industrial production declined in March while factory employment and payrolls shows little change. Wholesale prices continued to decline. Building and construction increased largely in public works and utilities. Residential building still lags.

The National Business Survey Conference, headed by Julius H. Barnes, finds improvement on the whole since the beginning of the year. Automobiles, shipyards, retailers and construction are showing increases. Residential building, textiles and foreign trade are lagging.

The National Metal Trades Association shows a mixed sentiment, reporting that a survey of 600 plants showed 77 per cent with business fair to very good, and 33 per cent with business as good or better than that of last year.

The general sentiment seems to be that business is not yet good but that it is improving. The bottom has been scraped and production is on its way up. This is partly seasonal and partly also due to the expansion programs of the large utilities, railroads and government public works.

No sharp rises are expected before the Fall, if then. On the other hand there is no fear of a crash. This year will probably go down on the records as a period of retrenchment after the undue expansion of 1929.

Prize for Plating Article

IN our January issue we announced the institution of two prize awards of $50 each for the best original paper published in THE METAL INDUSTRY during 1930 on metal manufacturing and metal coating. At this time, with the Platers' Convention bringing electroplating strongly before the public, we wish to emphasize the prize for the plating, polishing or finishing article. Everyone is eligible except those on the staff or associate editors of THE METAL INDUSTRY. We hope that our readers will take full advantage of the opportunity offered them.

Correspondence and Discussion

Problems in Foundry Practice

To the Editor of the Metal Industry:

I am interested in your replies to Problems 3958 and 3959 in your April, 1930, issue. Two things are in mind in connection with both the queries. The first is pouring temperature. I wonder if your enquirer has given this important point due consideration. For light work, it is very important, and it might be called especially to his attention.

The second point is whether or not composition ingot is being used, or virgin metals. In the answer to 3959, you advocate the use of new metal, which is, of course, splendid. It may be that ingot composition has been bought and utilized with the thought in mind that the analysis is the only point to consider. As you know, however, much composition is marketed and is the result of melting of bought scrap with the addition of sufficient new metal to bring the analysis to the required state. A great many of the dealers in composition merely melt and do not refine, and the result is a composition which is impure and may produce porous castings from oxidization, and at the same time, where strength is a necessity, very considerable is sacrificed through the purchase of melted composition instead of the paying of a slightly increased price to get refined composition. There are, as you know, a number of reputable refiners whose product is absolutely reliable and provides strength and purity at a cost only slightly in excess of the poorer quality of ingot—the latter being much more expensive, however, in the end.

Both queries are rather interesting, and I am prompted to write you along the above lines.

Neil C. Lamont, Works Manager,
National Electric Products Corporation.

Ambridge, Pa.,
April, 1930.

We do not consider that the pouring temperature was not at fault in this question. When pouring temperature enters into the cause of such trouble, the spongy effect will be found all through the casting. In problem 3958, pinholes show on the top side only; therefore we think this evidence shows the trouble is caused by gas, and we suggested the remedy which we think will correct the trouble.

In Problem 3959, pouring temperature may enter. However, we stated the trouble was in the metal and in such cases we have found it best to try using new metal first. If the trouble still continues, however, another remedy must be sought. No matter how refined the ingots are they are no better than new metal. We agree, however, that the best grade of refined ingot is the cheapest to use in the long run and recommend its use when ingot metal is desired. W. J. R.

New Books

Mechanical World Year Book—1930. Emmott and Company, Ltd., 65 King Street, Manchester, England. Size, 4 x 6½; 348 pages; price, 1s, 6d., net.

An annual handbook covering mainly the following:

Steam and the Steam Engine; Steam Turbines; Steam Boilers; Gas Engines; Oil Engines; Diesel Engines; Suction Gas Producers; Metals and Alloys; Structural Iron and Steelwork; Shafting; Toothed Gearing; Grinding; Forced and Shrinkage Fits; Ball and Roller Bearings; Belting; Rope Driving; Chain Gearing; Limits and Fits; Friction and Lubrication; Hydraulic Work; Pipes and Tubes; Foundation for Machinery; Foundry Work; Screw Cutting; Belt Conveyors; Epicyclic Gearing; Cutting Speeds; Weights of Metals; Mathematical Tables, etc.

Statistical Abstract of the United States—1929. Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C. Obtainable from Superintendent of Documents, Washington, D. C. Price, $1.00.

An invaluable reference work for business men, bankers, economists, students, etc., covering the latest available annual figures on practically every phase of American industrial and economic life. The major headings are:

Manufacturing and Mining Industries; Commerce; Agriculture; Forests and Fisheries; Miscellaneous, including population; National and State Debt; Money and Banking; Transportation; Education; Insurance; Immigration; and numerous other topics.

Proceedings of the American Society for Testing Materials, Vol. 29. Published by American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa. Two parts; size, 6x9; Part I, 921 pages; Part II, 1016 pages; each part, $6 in paper, $6.50 in cloth, $8 in half leather binding.

This is the annual publication of the Society, giving in full the proceedings of the Annual Meeting, held at Atlantic City last year. Part I contains the annual reports of 43 standing and research committees and 5 sectional and joint committees of the Society. They include reports of committees on Ferrous Metals and Alloys, Effect of Tin and Arsenic on High-Speed Tool Steel, Boiler Feed Water Studies, Non-Ferrous Metals, Cement, Ceramics, Concrete, Fire Tests of Materials, Gypsum, Lime, Preservative Coatings, Petroleum Products, Road Materials, Coal and Coke, Waterproofing Materials, Electrical Insulating Materials, Rubber Products, Textile Materials, Wire Cloth, Slate, Natural Building Stones, Methods of Testing, Metallography and Nomenclature and Definitions; 49 tentative standards which have either been revised or are published for the first time; annual address of the President and the annual report of the Executive Committee.

Part II contains 56 technical papers with discussion. These contain the symposium on physical properties of cast iron, the symposium on mineral aggregates, and valuable information on results of investigations by experts in the field of engineering materials including research problems involved in cohesion and atomic structure, the fatigue of metals and corrosion-fatigue of metals. A number of particularly interesting papers on non-ferrous metals are included. Mention should also be made of the many other papers on cement, concrete and brick, and on bituminous mixtures, rubber and a number of papers of interest in connection with the testing of materials describing new testing apparatus.

Government Publications

Brass, Wrought Iron and Steel Pipe Nipples. Resubmission of proposed federal specification. Federal Specifications Board, Washington, D. C. Free.

Metals. Proposed Revision of Federal Specification No. 339a, on General Specifications for Metals. Federal Specifications Board, Washington, D. C. Free.

Technical Papers

Chemical Engineering, 1930. University of Michigan, Ann Arbor, Mich. Official university publication, Vol. XXXI, No. 31, December 14, 1929, with graduate programs in general chemical, metallurgical, gas and organic chemical engineering. Free on application to the registrar.

Turning with Shallow Cuts at High Speeds, by H. J. French, senior metallurgist, and T. G. Digges, associate metallurgist, Bureau of Standards, Department of Commerce. Research Paper No. 120; price, 30 cents; obtainable from Superintendent of Documents, Washington. D. C.

A method is described for testing lathe tools under shallow cuts and fine feeds. The relations were determined between the cutting speed, feed, depth of cut, and tool life for carbon and high-speed tool steels. Comparisons were made of tools of different forms and of tool life when cutting dry and with water or lard oil. Heat treatment and chemical composition of the tools were also studied, including, in the case of high-speed tool steels, the effects of cobalt, nickel, molybdenum, arsenic, antimony, phosphorus, sulphur, copper, tin, aluminum, titanium, and tantalum. The results obtained under shallow cuts and fine feeds with these steels are compared with those obtained under heavy duty.

Acid Resisting Cover Enamels for Sheet Iron, by Andrew I. Andrews, Engineering Experiment Station, University of Illinois, Urbana, Ill. Free.

The investigation covered by this paper brought out the following results and conclusions: Simple acid resisting enamels can be made from the Na_2O—B_2O_3—SiO_2 series or the Na_2O—PbO—SiO_2 series. Silica increases the acid resistance of enamels. Increase of burning temperature increases the acid resistance of most enamels, although some enamels are acid resisting over their entire burning range. Increase in burning time increases the acid resistance of some enamels. Smelting temperature and time have little to do with acid resistance, provided that the enamel is thoroughly and properly smelted. Fineness of grinding does not affect the acid resistance. Clay added to the mill not always, but often, reduces the acid resistance. Opacifiers do not decrease the acid resistance when added to the mill. They often increase the acid resistance when added to the smelt. Titanium oxide improves the acid resistance and does not increase the refractoriness as much as does silica. All fluxes have a tendency to decrease the acid resistance. Fluxes properly proportioned will, however, give acid resisting enamels, even though present in large amounts. Fluorspar is particularly detrimental to the acid resistance, but in certain combinations of other fluxes it may be added in small amounts without injuring the acid resistance. Lead oxide is a desirable constituent in acid resisting enamels, not because it improves acid resistance, but because it adds fusibility, and does not injure acid resistance as much as many other fluxes.

Investigation of Endurance of Bond Strength of Various Clays in Molding Sand, by Carl H. Casberg and William H. Spencer, Engineering Experiment Station, University of Illinois, Urbana, Ill. Bulletin No. 200, free.

The objects of the investigation reported in Bulletin No. 200 of the Engineering Experiment Station of the University of Illinois were (1) to determine the physical and chemical properties of a number of clays; (2) to compare the various clays for endurance of bond strength when used as bonds in molding sands under casting conditions; (3) to determine the thermal conductivity of molding sands and the effect of heat on clays and molding sands; and (4) to determine the effect of repeated heatings on the permeability of molding sands.

The bulletin contains a list of the clays tested and their sources, a description of the apparatus used, a discussion of the methods of testing, and the results obtained.

Practical Methods of Reducing Fatigue. National Safety Council, 20 North Wacker Drive, Chicago, Ill. Safe Practices Pamphlet No. 50. Sold by subscription; apply to publisher.

Describes and illustrates simple methods which have been found effective in reducing fatigue in industrial workers, with brief mention of the more general aspects of the subject.

Floors and Flooring. National Safety Council, 20 North Wacker Drive, Chicago, Ill. Safe Practices Pamphlet No. 11. Sold by subscription; apply to publisher.

Practical information on safe floors, making for higher efficiency of workers as well as accident prevention. Requirements, maintenance, materials, loads, vibration, weights of materials, placing of machinery, stairs and stairways and other aspects are treated.

A New Dead-Weight Testing Machine of 100,000 Pounds Capacity. By L. B. Tuckerman, Herbert L. Whittemore, and Serge N. Petrenko, Bureau of Standards, Department of Commerce, Washington, D. C. Price, 5 cents, from Superintendent of Documents, Washington, D. C.

The functions of the Bureau of Standards are outlined, and the importance of calibrating testing machines is emphasized. The different methods of calibrating testing machines (A. S. T. M. specifications) are given, and the limitations of each are discussed. The development of the proving ring is mentioned, and the need for apparatus for applying, preferably by dead weights, forces which are known accurately is brought out. The dead-weight machine, capacity 100,000 pounds, which has been installed at the bureau is described and illustrated. Particular attention is given to the accuracy of the forces which can be applied by this machine and the precautions for maintaining the accuracy.

Reliability of Fusible Tin Boiler Plugs in Service. By J. R. Freeman, J. A. Scherrer and S. J. Rosenberg, Bureau of Standards, Department of Commerce, Washington, D. C. Price, 10 cents; from Superintendent of Documents, Washington, D. C.

In cooperation with the Steamboat Inspection Service a study has been made of the reliability of fusible boiler plugs of the type installed in ships' boilers under the jurisdiction of the Inspection Service. It has been found that under certain conditions fusible plugs would not operate due to the formation in service of a refractory oxide replacing the tin in the fire end of the plug. Apparatus is described in which plugs may be tested under simulated service conditions. The results of examination and tests of 184 plugs returned from service indicated that 10 per cent of all plugs in service would not operate when and if required. Recommendations regarding specifications and design of plugs to eliminate this dangerous condition are made.

Throwing Power in Chromium Plating. By H. L. Farber[1] and W. Blum, Bureau of Standards, Department of Commerce, Washington, D. C. Price, 10 cents; obtainable from Superintendent of Documents, Washington, D. C.

During recent years chromium plating has come into extensive use in spite of the fact that it is very difficult to deposit chromium in recessess of irregularly shaped articles. General principles show that in the chromic acid baths used for plating there is little hope of radically improving the "throwing power." The purpose of this investigation was to define those operating conditions which yield the highest throwing power, which at best is poor.

The ratio of the weights of metal deposited on two cathodes, one of which is twice as far from a gauze anode as the other, gives a quantitative measure of throwing power. If, under these conditions, as is invariably true in chromium plating, this metal ratio is greater than 2:1, the throwing power is negative. The best throwing power obtained was —13 per cent. Under less favorable conditions it was —100 per cent or still poorer.

The conditions found to yield the best throwing power are (a) a high temperature such as 55° C. (131° F.); (b) a high current density such as 35 amp./dm.^{2} (325 amp./ft.^{2}); (c) a low concentration of chormic acid such as 150 to 250 g/L (20 to 33 oz./gal.); and (d) a low sulphate content, for example, $\frac{CrO_3}{SO_4} = 200$. These conditions usually require a potential of over 6 volts. If this is not available, fair throwing power can be obtained in a more concentrated solution with a lower temperature and current density.

The numerical results for throwing power are approximately parallel to the covering power, as measured with copper cathodes bent at right angles.

[1] Research Associate, American Electroplaters Society.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical

H. M. ST. JOHN — W. J. PETTIS
W. J. REARDON — P. W. BLAIR

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE — A. K. GRAHAM, Ph.D.
G. B. HOGABOOM — WALTER FRAINE

Questions and Answers

To give a satisfactory answer to a question requires considerable time and careful consideration. The same applies to the making of an analysis of a solution and suggesting corrections.

If those submitting questions will describe fully their trouble, or explain in detail what they wish, it will greatly assist our expert in solving the problem. When any particular finish is desired, send a sample if possible. If impossible, refer to some particular shade of color desired and state the composition of the base metal.

When sending a sample of solution for analysis, be sure to take a correct sample, for one that is not correct is of no use at all. In fact, it will give a wrong analysis of the solution and cause incorrect suggestions to be made. When taking a sample of the solution, adjust the solution to the proper level by the addition of water. Stir solution thoroughly and then take a two- or three-ounce bottle for sample. Label and place sender's name and address on the label. This is necessary for identification. The bottle should be properly corked.

A GLASS STOPPER MUST BE USED WHEN SENDING A CHROMIUM SOLUTION.

The bottle must be sealed and packed properly to prevent breakage in transit. A convenient container for mailing is a mailing tube, which may be purchased at any local post office. A letter should be sent stating the volume of solution; temperature and current density at which the solution is operated; the original formula of the solution, if possible; class of work being plated; and what defect is produced in the deposit.

It is our desire to help solve our readers' problems. By fully co-operating with us, inquirers will place us in a better position to give answers that will prove most satisfactory.

Beryllium in Brass

Q.—In the January issue I notice your article replying to an inquiry on dense castings of red brass and bronze. Respecting that, I wondered what is known about the uses of small percentages of beryllium in getting dense castings. It is said Siemens-Schukert and others are making much use of it. Do you know?

A.—We have your letter reference to the use of beryllium for lever casting used on acetylene gas tank fittings. As we stated before, this class is made mostly from forged brass, which is a cheap material; to add beryllium would be very expensive and I do not know of any work being done with this material added to brass in this country.

An article by Illig Masing Dahl, Kroll and Becker, of Germany, states that most of the mixtures studied by them have been alloys with copper, nickel, cobalt and iron. These show remarkable improvement in properties when heat treated; copper alloy with 2.39% beryllium shows a Brinell of 100 prior to treatment, then rising to 440 Brinell after 17 hours soaking at 300° F.; tensile strength of unheated metal, 70,000 lbs., after treatment, the order of magnitude is 194,000. Transverse bending strength goes from 77,000 to 310,000, and the yield point rises from 22,500 to 183,000. The elastic limit rise is even more astounding.

So far these figures it would apear that beryllium would surely help brass for this work, as you suggest. However, beryllium is quoted in this country at $200 per pound and shipments are made chiefly from a small stock manufactured in 1927. This is the information we have on this material. Further details may be had in Information Circular 6190, Beryllium and Beryl, which may be obtained from the U. S. Bureau of Mines, Department of Commerce, Washington, D. C. W. R. J., Problem 3,972.

Black on Steel

Q.—I am enclosing herewith a thin piece of carbon steel that is rubber stamp marked .001½. This marking is more of a stain than an etch, which is indicated by the smooth surface of the black parts. If there had been acid action to any degree the black parts would not be quite so smooth but would show a matt.

Can you tell me how such a black can be produced by quick chemical action? Any assistance you can give me in this matter will be greatly appreciated.

It must be remembered that when a solution or other mixture is applied with a rubber stamp, only a very thin film is transferred.

I am also enclosing a piece of steel tape which shows a very good black. Can you suggest what it might be?

A.—On the sample strip received the figures .001½ have been printed on with steel type. The back of the strip shows the distinct impression of the type in making the print. We know of no chemical formula that would produce this exect as cheaply or as satisfactorily as the printing method.

The piece of steel tape enclosed with your letter is a photographic etching filled with a flat black paint which is easily removed with a varnish remover. W. F., Problem 3,973.

Bright Dip for Aluminum

Q.—I would like to know a dip to brighten aluminum screws to a bright finish. We do not like to buff them and ball burnishing bends the heads together.

A.—There is no dip that will brighten aluminum as brass may be brightened in an acid dip. Aluminum products come out of a bright acid dip with a clear dull sheen, which is characteristic of the metal.

If the screw heads have any curvature at all, they can be brightened by bright dipping in the ordinary dip made up of 3 parts sulphuric acid to one part nitric acid or aqua fortis, using two ounces of muriatic acid per gallon for a blender. Rinse thoroughly in cold water and transfer to an oblique brass rolling barrel. Cover the work with cold water, add two ounces of cream of tartar and roll. The larger the load the faster the polishing action will be. Do not use steel balls as the weight of the screws will give sufficient polishing action.

Flat head screws do not polish satisfactory by rolling, due to the flatness of the head. W. F., Problem 3,974.

Casting Aluminum

Q.—We are having considerable trouble with porous spots or oxidation in our aluminum alloy pistons. We cast these in cast iron molds with baked sand cores. Our aluminum and hardening alloys are of new metal and high grade. The finished piston has the following composition: aluminum 91.6, copper 6.0, tin 0.4, iron 1.0. We melt our metal in cast iron pots and pour at 1350° to 1450° F. We have used both zinc chloride and sodium fluoride as a flux, with about the same unsatisfactory results in each case.

Can you give us any information to correct this trouble?

A.—We are of the opinion that some of your trouble is caused by melting your aluminum in an iron pot. The latent heat of aluminum is such as to cause the iron to oxidize and give out a gas. That, in our opinion, is at least some of your trouble. We suggest that you use the iron pot only for a holding pot and melt the metal in a crucible furnace. Pour into the iron pot, then only keep enough heat in the pot to keep the meta at the proper temperature. Of course, your method of gating must also be considered, as the metal chills quickly outside and stays hot inside; your gating must be such that it will stay open in the pouring. Sprue until all the inside is set; that is, the ribs etc., in the casting.

See that your holding pot is cleaned out every night.

W. J. R., Problem 3,975.

Defective Nickel

Q.—We are sending you a sample of nickel solution which we would like you to analyze and comment on. It has not been operating properly and we believe there is a defect in the solution.

A.—Analysis of solution:

Metallic nickel	1.54 oz.
Chlorides	6.04 oz.
pH	6 oz.

We would suggest that the metal content be raised by the addition of single nickel salts. Add 4 ounces to each gallon of solu-

O. J. S., Problem 3,976.

Molybdenum Bronze

Q.—I am writing you for a little information on a bronze mixture. A customer calls it "molybdenum bronze," if you know what this is. Will you kindly let me know what the mixture is. I would like to get a book of brass and bronze and aluminum mixtures, where the different formulæ are given, S. A. E. specifications, and what kind of a casting they may be used for. Molybdenum bronze in this case is wanted for valves which have to resist acid.

A.—We have no record of anyone producing molybdenum bronze. The writer made several experiments some years ago but without results. Molybdenum is used in special steel resembling tungsten, but it is said two or three times as powerful. It is not used extensively as it is difficult to prepare in the pure state. Its ores do not occur so plentifully and it is difficult to alloy with steel because of its liability to oxidize. Metallurgical molybdenum, when pure, is a silver white metal of high fusion point, having a specific gravity of about 900. It is as malleable as iron and, like it, takes up carbon easily by cementation.

Some years ago the American Molybdenum Company of Boston, Mass., opened a molybdenum deposit and built a concentrating mill, and should have become a regular producer. We suggest you write them for further information as we have no record of molybdenum bronze. They may have some. Also, technical publication No. 191 by Burnham E. Field, Institute of Metals Division, states:

"The results of investigations on the resistance of the nickel molybdenum alloys to hydrochloric acid has been confirmed by experiments of Guertler, Rohn, Schulz, Jenge, and others, but thus far only one such alloy has approached commercial production in Germany; this contains approximately 15 per cent chromium and 7 per cent molybdenum, with the remainder chiefly nickel."

W. J. R., Problem 3,977.

Nickel Analyzed

Q.—We are sending you two bottles of nickel solution to be analyzed for metallic content, nickel, chloride, and pH.

A.—Analysis of nickel solutions:

No. 1 Metallic nickel	2.55 oz.
Chlorides	2.13 oz.
pH	5.2
No. 2 Metallic nickel	2.58 oz.
Chlorides	2.13 oz.
pH	5.2

Analysis shows that the constituents of both solutions are identical. The metal and chloride contents of both solutions are good, but the pH of both solutions would be considered too low for the usual solution.

We suggest that you add ten fluid ounces of 26° ammonia to each one hundred gallons of each solution.—O. J. S., Problem 3,978.

Nickel and Chromium

Q.—Samples of our nickel and chromium solutions are being sent to you. The nickel is used under the chromium. Nickel gives trouble by peeling after the chromium is put on, or while chromium is being put on.

The chromium solution seems to be good but we would like it analyzed to know what is in it and if it is chemically correct.

A.—Analysis of nickel solution:

Metallic nickel	2.88 oz.
Chlorides	1.92 oz.
pH	6.8

Add 8 fluid ounces of chemically pure sulfuric acid to each 100 gallons of solution.

Chromium solution analysis:

Chromic acid	47.06 oz.
Trivalent chromium	1.76 oz.
Sulphates	0.23 oz.

Add 7 fluid ounces of chemically pure sulfuric acid to each 100 gallons of solution and reduce the trivalent content by the porous pot method.—O. J. S., Problem 3,979.

Polishing Brass

Q.—Will you kindly advise me as to the speed of wheels, the kind and size, and what material is used on them to produce a high finished color on brass?

A.—The kind of wheels to be used to produce a highly polished finish upon brass will depend upon whether the metal is cast or rolled.

If cast, it will be necessary to use a canvas, felt, rag or sheepskin wheel set up with No. 80 or No. 120 emery. It is used dry. The next operation would be using one of these wheels and applying oil or tallow to same and is usually termed a grease operation. These wheels should be operated at 1800 r.p.m. for 12 or 14 inch wheels.

The next operation is termed buffing and consists of using either a stitched or loose leaf muslin buff and the abrasive tripoli. These are operated at a speed of 2400 to 2800 r.p.m. for 12 to 14 inch wheels. The final, or coloring, operation is produced on a loose leaf muslin buff, usually padded and well raked out, and used with a lime composition. These wheels are 8 to 10 inches in diameter and are operated at a speed of 2800 to 3000 r.p.m.

If the brass is rolled stock, the first operation is usually the grease wheel one, and other operations the same as for cast work.

O. J. S., Problem 3,980.

Solution Analysis

Q.—Please publish a good but simple method of analysis of nickel solutions.

A.—For methods of analysis of nickel solutions, refer to THE METAL INDUSTRY, as follows: June, 1926, pages 236-237; July, 1926, pages 280-282; August, 1926, page 327. The methods outlined there by Oliver J. Sizelove are written to be understood by the practical plater and should fill all your requirements.

Ed., Problem 3,981.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,742,557. January 7, 1930. **Noncorrosive Aluminum Alloy.** Roland Sterner-Rainer, Neckarsulm, Germany, assignor to American Lurgi Corporation, New York.

A corrosion-resistant alloy of aluminum and magnesium, the magnesium content of which does not substantially exceed the solid solubility of magnesium in aluminum, said alloy being free from magnesium-rich β-type crystals and containing at least one metal of the group comprising antimony, bismuth and cadmium, and at least one metal of the iron group.

1,742,710. January 7, 1930. **Process of Transferring Subjects to Metal Surfaces.** Henry L. Krebs, Chicago, Ill.

The method of forming an image on a zinc or copper surface, which consists in bleaching a silver print, laying the print on said surface, and applying a reagent to effect a chemical reaction between the print and the zinc or copper.

1,743,303. January 14, 1930. **Alloys.** Frank W. Andrews, Dayton, Ohio, assignor, by mesne assignments, to Frigidaire Corporation, a Corporation of Delaware.

A plastic metallic packing composition having coefficient of expansion approximating that of cast iron and steel and consisting of lead, tin and bismuth in the following proportions:

	Parts
Lead	90 to 96
Tin	1 to 3
Bismuth	4 to 4

1,743,465. January 14, 1930. **Apparatus for Removing Oil from Metal.** Oscar L. Maag and Clifford M. Maratta, Canton, Ohio, assignors to The Timken Roller Bearing Company, Canton, Ohio.

Apparatus for removing oil from oily metal chips and the like comprising a housing, a multiplicity of spray devices therein, a conveyor for carrying chips beneath said spray devices, a trough beneath said conveyor for collecting oily liquid dropping from said chips, a separator tank at the discharge end of said trough adapted and arranged to receive said oily liquid from said trough, an oil sump.

1,743,466. January 14, 1930. **Process of Recovering Oil from Metal.** Oscar L. Maag and Clifford M. Maratta, Canton, Ohio, assignors to The Timken Roller Bearing Company, Canton, Ohio.

The process of recovering oil from oily metal chips and the like which comprises continuously moving said chips on a way, repeated spraying the moving chips with hot water and then draining off the oily water and separating the oil from the water.

1,743,515. January 14, 1930. **Process of Treating Aluminum with Halogen Gases.** Robert J. Anderson, Fairmont, W. Va., assignor to Fairmont Manufacturing Co., Fairmont, W. Va.

The process which comprises removing an impurity from aluminum containing aluminum oxide as an impurity by the application of halogen gas thereto so as to combine with the aluminum oxide therein.

1,743,865. January 14, 1930. **Cleaning and Polishing Compound.** Frederick J. Pilgrim, Detroit, Mich.

A metal cleaning and polishing compound consisting of the following ingredients in approximately the following proportions by weight: 80 parts quicklime high in magnesia, 40 parts kerosene, 20 parts stearic acid, 20 parts of tallow.

1,743,849. January 14, 1930. **Light Metal Alloy.** John A. Gann, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich., a Corporation of Michigan.

As a new product, an alloy containing approximately ninety per cent (90%) of magnesium, from two to eight per cent (2%-8%) of aluminum, from two to four per cent (2%-4%) of copper, from one to two per cent (1%-2%) of cadmium, and one-fourth of one per cent (0.25%) of manganese.

1,744,545. January 21, 1930. **Aluminum Alloy.** Horace Campbell Hall, Littleever, Derby, and Tennyson Fraser Bradbury, Derby, England, assignors to Rolls Royce Limited, Derby, England.

An aluminum alloy composed of the elements and that in the relative quantities within the ranges set out below: nickel, .2 to 1.5% of the whole; magnesium, .2 to 5% of the whole; copper, .5 to 2% of the whole; silicon, .2 to .5% of the whole; iron, .7 to 1.5% of the whole; manganese and titanium up to a total maximum of .25%; aluminum the remainder; only traces of other elements.

1,744,717. January 28, 1930. **Alloy Wire.** William H. Bassett, Cheshire, Con., assignor to The American Brass Company, Waterbury, Conn.

A metal conductor wire comprising an alloy of cadmium, zinc and copper, having from about one-half to about one and one-half per cent cadmium, from about two to about seven per cent zinc, and the balance copper.

1,744,792. January 28, 1930. **Electroplating Apparatus.** James George Newey and Cecil Bertram Jerred, Birmingham, England.

Electro-plating apparatus comprising a hollow rotatable barrel, hollow trunnions on which said barrel is mounted, an insulated anode disc mounted in recesses in each end of said barrel and a disc of insulating material covering but spaced from each anode disc.

1,744,983. January 28, 1930. **Inductor Furnace.** Edwin Fitch Northrup, Princeton, N. J., assignor to Ajax Electrothermic Corporation, Ajax Park, N. J., a Corporation of New Jersey.

In an inductor furnace free from interthreading of transformer or furnace iron, a furnace inductor and a short-circuited coil surrounding the inductor and adapted to receive induction from it to counteract by the stray field of the short-circuited coil that part of the stray field of the inductor outside of the short-circuited coil.

1,745,185. January 28, 1930. **Process for Coating Metal Articles with Lead.** Spencer Otis and Wilson T. Herren, Barrington, Ill., assignors to National Boiler Washing Company of Illinois, Chicago, Ill.

In a process for coating metal articles with metal, depositing a preliminary coating thereon from a solution of lead, applying an aqueous solution of a flux thereto, then applying a molten flux thereto, then dipping in molten metal.

1,745,314. January 28, 1930. **Bearing Alloy.** John V. O. Palm and Edward C. Knuth, Cleveland, Ohio, assignors to The Cleveland Graphite Bronze Company, Cleveland, Ohio.

A bearing alloy consisting of approximately 67 per cent lead, 15 to 18 per cent of cadmium, 5 to 10 per cent of zinc, and 6 to 15 per cent of antimony.

1,745,371. February 4, 1930. **Lead-Covering of Electric Cables and the Like by Extrusion.** Ernest Edward Judge, Gravesend, England, assignor to W. T. Henley's Telegraph Works Company Limited, London, England, a British Company.

A nose or point for use in apparatus for the leadcovering of electric cables and the like by extrusion, wherein the nose or point is slidably mounted within a ring which is itself mounted at the forward end of a main carrier so as to abut against a shoulder therein.

1,745,464. February 4, 1900. **Process for the Purification of Metals.** Franz Wever, Dusseldorf, Germany, assignor to Kaiser-Wilhelm institut für Eisenforschung, Dusseldorf, Germany.

Process for refining metals and alloys carried out in a high frequency induction furnace consisting in smelting the metal with slags.

1,745,720-1. February 4, 1930. **Bearing Metal and Method of Making Same.** Robert Jay Shoemaker, Chicago, Ill., asasignor to S. & T. Metal Company, Chicago, Ill., a Corporation of Illinois.

An alloy consisting principally of lead and containing sodium in an amount not in excess of 1.0 per cent by weight; calcium 0.1 per cent to 0.25 per cent; and aluminum 0.02 per cent to 0.1 per cent.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Ventilating of Automatic Plating Machines at the Crosley Radio Plant

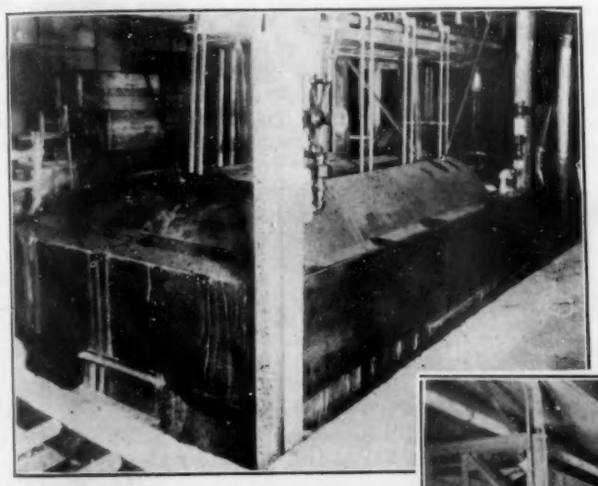
Based on an interview with
R. W. PRINZ, Plant Engineer, The Crosley Radio Corporation

By D. W. MacDONALD

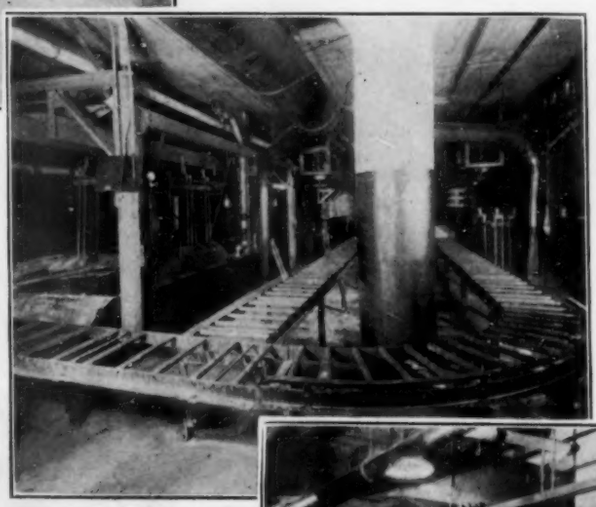
In the basement of one of the Crosley plants in Cincinnati is one of the most interesting automatic plating layouts in the country. R. W. Prinz, Plant Engineer, designed the installation to meet the particular requirements of Crosley production, and while many problems of design in the plating equipment itself were met and solved the principal problem was that of adequate ventilating. Removal of steam and fumes was not only necessary in order to permit operators to work around the equipment, but the corrosive nature of the fumes necessitated prompt and complete removal to prevent ruin of expensive electrical equipment and sheet metal parts.

The engineers on the ventilating were Young & Bertke of Cincinnati and it was due to their ingenuity that the ventilation has proved so successful despite the problems encountered.

It is difficult to give an adequate impression of the size of the Crosley plating equipment by either picture or word. The basement location of the machines and their size limits photography; much of the interesting construction of tanks and ventilating ducts is underground, and words cannot properly convey a complete idea of the intricate equipment.



1. Above—Large Tank at Head of One of the Automatic Plating Machines Handling Large Parts of Radio Sets.



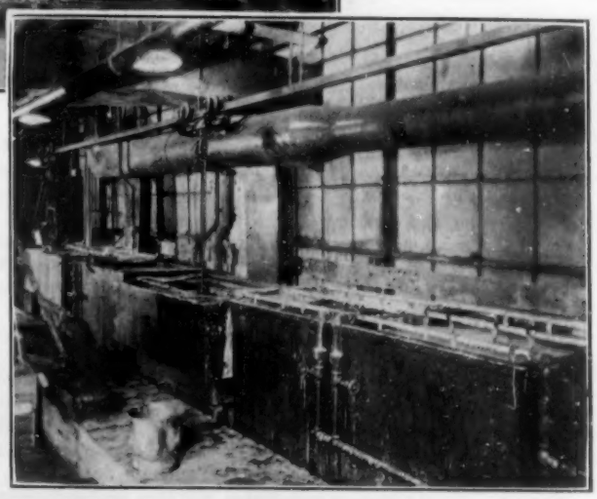
2. At Right—General View of Automatic Plating Machine, with Second Unit at Right Showing Gravity Conveyor Layout. Machine Built by Hanson-Van Winkle-Munning Company. Ventilating Installation by Young and Bertke.

However, the unusual requirements of the ventilation can quickly be understood when it is known that a previous attempt failed to remove the great quantities of steam and fumes arising from these machines when in operation. This was because of the unusual size of the plating vats, seven feet wide by twelve feet long, and the difficulties encountered in designing proper hoods that would allow vertical clearance for parts dipping up and down on moving conveyors.

Ordinary side-vent suction was not sufficient to pull fumes from the center of these big tanks and the moving arms of the parts conveyor prevented the complete hooding of the tanks.

Illustration No. 1 shows a close-up of one of these big tanks at the head of one of the plating machines, and No. 2, shows a general view of the plating machine and also a second identical unit to the right.

The method used by Young & Bertke in overcoming the difficulties of this ventilating problem was the combination of air supply and air exhaust applied to each tank. Since the exhause suction on the side vents around the edge of the tank could not pull fumes from the center of the tank, a central hood

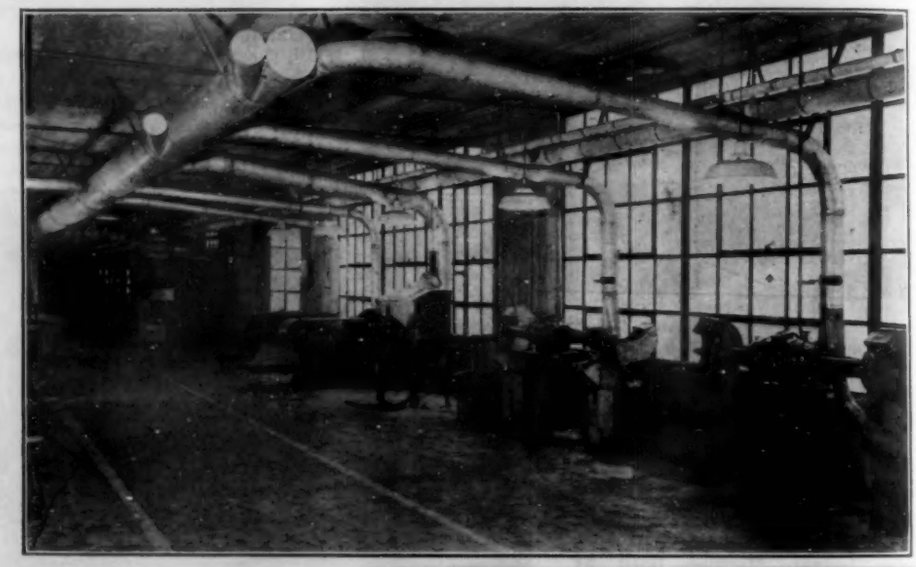


3. Below — Tanks for Experimental Work. Second Tank from Foreground Is for Cleaning; Note its Side Vented Hood for Direct Fume Exhaust, Protecting Worker's Face. Plating Tank in Foreground Is for Cadmium and Does Not Require the Exhauster.

was constructed at the tank center through which air was forced through special nozzles which flattened the spread of air and directed it over the surface of the tank, driving the fumes from the center to the tank sides into reach of the exhaust vents.

On the large tanks in the two automatic machines the high velocity supply is distributed from the center to all sides of the tank. Exhause vent openings are continuous all around the tank edge. On the smaller tanks farther down the line of automatic machines the supply air is blown over the surface from the side nearest the operator and into the exhaust vents on the opposite side.

4. Above — Fan Room. Fans Built by American Blower Company, of Alcumite, a Corrosion-Resistant Aluminum Bronze Made by the Duriron Company.



5. At Right — Dust Collecting System in Buffing and Polishing Department.

Thus no fumes can possibly reach workers. In illustration No. 3 the smaller hand plating tanks for handling experimental and short run lots do not have a supply system as they are small enough for the exhaust suction to pull all the fumes.

In the automatic system the method of utilizing supply air helps to reduce another problem in plating ventilation—that of condensation throughout the piping. The life of sheet metals subjected to the acid fumes and constant condensation is very short.

As the relative humidity of the supply air is low it is capable of absorbing a portion of the moisture arising from the tanks.

If this moisture were not controlled resulting condensation would greatly increase the rate of corrosion and shorten the life of the installation. Carrying this moisture in suspension out of the system lengthens its life.

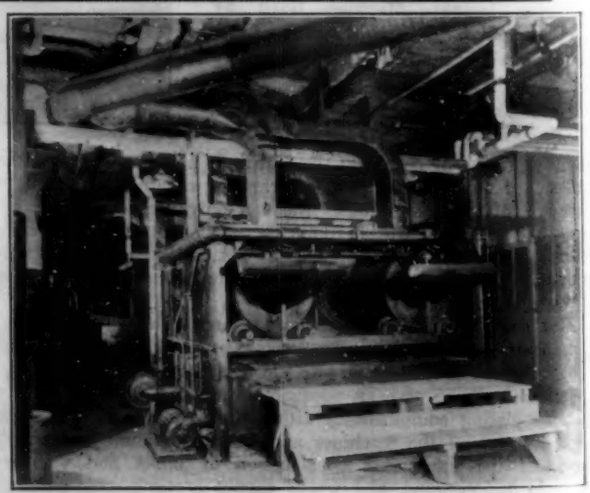
A further improvement in this installation which reduced costly replacement of piping was the designing of the system to permit underground concrete fume removal ducts instead of overhead sheet metal ducts, and wherever this was not possible acid-resisting metal with welded seams was used.

With the present plating installation the fans are underspeeded. When additional future capacity is required additional tanks can be ventilated by simply bringing the fans up to a higher speed. All of the fans for the various ventilating units are grouped in a single fan room (illustration No. 4). The fans which handle corrosive fumes are built of acid-resisting metal. Fumes are disposed of through a 60 ft. metal stack and discharged above the roof line of the buildings. These fans handle approximately 45,000 cubic feet per minute and utilize approximately 45 h.p. with the present plating installation.

In the ventilating of the Crosley plating installation the economics of engineering are largely secured by maximum enclosure of the machines and tank openings and the designing of piping to remove steam and fumes with the minimum amount of air. This ventilation system was necessarily expensive, but it more than saves its cost in the protection of plant equipment, particularly the elaborate electric equipment connected with the plating process, for instance. Were it not for the removal of fumes not only would work be impossible around the machines, but the hundreds of feet of ½ and ⅛ inch copper bus-bar for carrying the plating current would be rapidly destroyed by corrosion.

The efficiency of this ventilating system is particularly important because the installation is in a basement and without the ventilating system the plating operations would fill the room with steam and fumes in less than fifteen minutes.

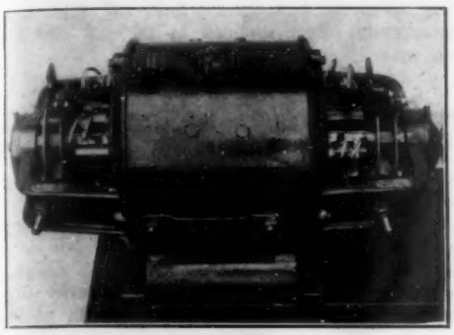
In addition to the Young and Bertke ventilating system on the several Crosley plating machines, there is a Y-B dust collecting system on seven buffing and polishing machines in another department (illustration No. 5). This installation has particular interest because of the way in which extra capacity for future requirements has been provided for.



6.—Plating Machine for Small Parts, Built by N. Ransohoff, Inc.

Generator with Variable Voltage

Users of generators, especially electroplating plants, often find it necessary to use several different voltages for their work. For this purpose, some have more than one generator and some change over a single generator, the latter procedure being complicated, as a rule, due to the necessity of making changes in the line connections. The Columbia Electric Manufacturing Company, 1292 East 53rd Street, Cleveland, Ohio, announces that it has devised a means whereby the user of a generator can have either six or twelve volts with a minimum of trouble in changing over. This is stated to be especially desirable where the same generator is needed for still tank as well as barrel plating.



Variable Voltage Generator.

The double commutator type of generator manufactured by the Columbia company is compound wound and self-excited. It is equipped with external connections, as shown in the accompanying illustration, and only the removal of four nuts is required to change the machine over from one voltage to another, which, the makers say, is a means of providing what amounts to two machines in one, although it can be used at only one of the voltages at a time. Heavy busses are used to make the connections and it is not necessary to alter line connections whatever.

Bogue Electric Company Moves

Charles J. Bogue Electric Company, for many years located in New York City, manufacturers of generators and motor-generator sets for electroplating and other purposes, has moved its works and offices to 16th Street and River Front, Hoboken, N. J., where larger quarters have been provided to take care of the company's steadily expanding business. The former address was 132 King Street, New York City. At the new location in Hoboken, the Bogue plant is provided with ample shipping facilities, a freight belt line entering the plant. New machinery and other equipment has been installed which insures more rapid and efficient production and more prompt filling of orders.

The company announces that it has recently brought out a line of interpole generators and motor generator sets of 2500 to 10,000 ampere capacity, 6-8 and 12 volts. These are equipped with roller bearings and are designed upon the most modern engineering principles. The company puts ball bearings on similar generators in 1500 ampere and smaller sizes. It is stated that a large number of orders have been booked for this equipment and that the company's prospects are very bright.

New Type Hand Cleaner

A new type of hand cleaner for mechanics and others who have difficulty in cleaning their hands after working has been placed on the market by the Magnus Chemical Company, Garwood, N. J. The new product is a powder which the company states has been put in use extensively by firms where employes do buffing, painting, enamelling and japanning, the cleaner being particularly efficacious in removing these substances from the hands.

The new hand cleaner is packed in cans, such as shown in the illustration, and also in kegs of barrels. A wall dispenser is provided for those purchasing the materials in bulk.

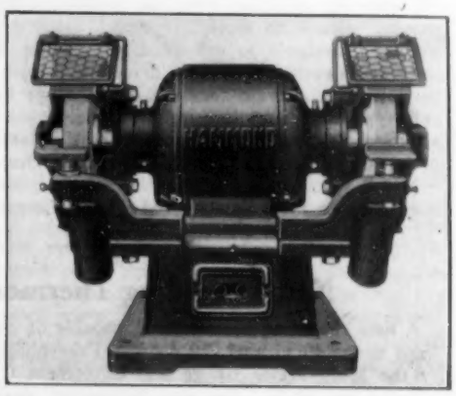
Heat Resisting Aluminum Paint

Ultra Fuzon Distributing Company, 151 Fifth Avenue, New York City, announces that after considerable research, their laboratories have developed an aluminum paint having extremely high heat resistant properties and which is especially desirable for application to metal surfaces which must undergo high temperatures without scaling or oxidizing. The company making "Ultra Fuzon," as the paint is called, states that it is applied like ordinary aluminum paint—by brush, dipping or spray system. The following advantages are claimed for it: that it will withstand temperatures up to 2000° Fahrenheit; will not change from its aluminum color up to 1200° Fahrenheit; will turn to a dark grey color after this temperature is passed; will penetrate the pores of metallic surfaces to which it is applied, thereby "fusing on"; will not discolor by exposure to weather; will last longer than ordinary paints under practically all conditions.

The new type of aluminum paint is prepared from powder which is mixed with bronzing liquid, a special type of which, "Liquid C," is sold by the company for this purpose.

New Bench Type Electric Grinder

A new type of electric grinder for use on the bench has been placed on the market by Hammond Machinery Builders, Inc., Kalamazoo, Mich. The same machine is also supplied with pedestal, for floor mounting. It is made in 1½ and 2 horsepower sizes, for 110, 220, 440 or 550 volt, 1, 2 or 3 phase alternating current, or 110 or 220 direct current, use. The 1½ horsepower size is for grinding wheels of 10 inch diameter and 1½ inch face, while the 2 horsepower size is for wheels of 12 inch diameter and 2 inch face.



Electric Grinder for Bench Use.

The machine is stated to be excellent for general use and light production grinding, being identical in construction to the company's large grinders which run up to 10 horsepower. Totally enclosed motor which cannot be injured by dust or dirt, capable of withstanding 100 per cent overload, with pushbutton control, is provided. Cutler-Hammer automatic motor starter is mounted inside the pedestal. Other features are chrome nickel steel shaft, ball bearings which are protected from dirt by labyrinth seal, convenient oil cups, oil level gauge, adjustable steel wheel guards, exhaust outlets for attachment to exhaust system, shatterless glass eyeshields, pedestals of unique design providing maximum foot room for operator.

Welded Tanks

A complete line of welded iron tanks is manufactured by the Storts Welding Company, Meriden, Conn. These products are stated to have definite advantages over other types of tank equipment. The manufacturer states, furthermore, that in manufacturing its products, the element of quality rather than price is considered, in order to provide highly serviceable units to tank users. A specialty of the company is the manufacture of welded tanks of "Armco" ingot iron. Tanks of any size and shape upon specification can be provided by the Storts company, it is stated.

Motor Driven Buffing Lathes

A line of motor driven buffing lathes is manufactured by the Bridgeport Safety Emery Wheel Company, Inc., Bridgeport, Conn., widely known makers of emery wheels and other grinding polishing requisites. The buffers are made in two sizes, one being 40 inches high, with 52-inch spindle length, the other 38 inches

New Buffing Lathe.

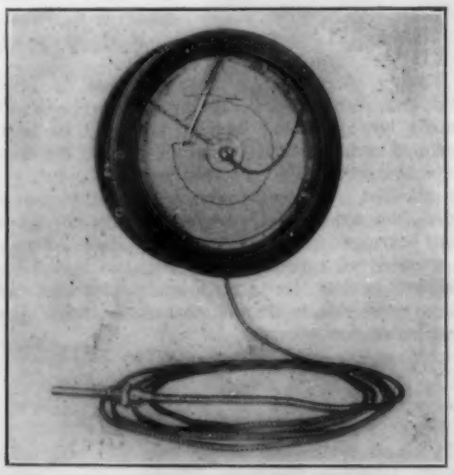
high, with 77-inch spindle. The machines are 3, 5, 7½ and 10 horsepower, all having 1800 r.p.m. motor speed; 2, 3 or 4 belts are used, according to size.

These machines are stated to be rigid and enduring, being built to fit the job rather than a certain price. They are said to be particularly adapted to large and awkward work requiring lots of room for swinging. Spindle speeds can be varied by changing driving sheave on motor. General Electric ball bearing motors are used, designed to withstand overloading and protected against dust and overheating. Belt drive of V-type. Ball bearings are used throughout, the four spindle bearings being carried in two split-type cast iron housings. Spindles are high carbon steel, accurately ground, with force-fit tight collars. A locking pin is provided for keeping spindles rigid while changing wheels.

Motor specifications other than those regularly provided by the manufacturer must be approved by the company, it is stated.

New Recording Thermometer

A new recording thermometer, capable of charting temperatures from minus 40 to plus 750 degrees Fahrenheit, has been perfected by the Moto Meter Gauge and Equipment Corporation of Long Island City, N. Y. The new instrument, developed after several



New Type of Recording Thermometer.

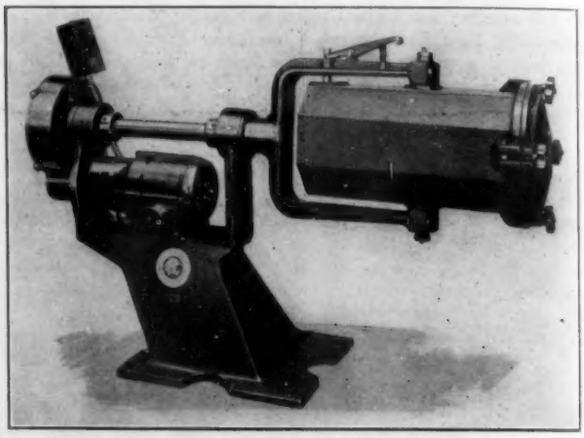
years of experimentation, is known as the "Model 1,000 Motoco Recording Thermometer."

In design, the instrument consists of a dust-, fume- and moisture-proof housing which encloses the working parts. The element is comprised of a bulb, capillary tube and Bourdon tube, filled solidly with a special liquid which has an equal coefficient of expansion over the entire scale range. When the bulb is subjected to heat or cold, the liquid content in it expands or contracts and this action is transmitted through the capillary tubing to the Bourdon tube, causing the latter to wind or unwind and move a pen across the face of a chart actuated by a 24- or a 7-hour clock mechanism.

The ratio between the pressure of the liquid and the movement of the pen is one to one, so that levers, hair springs, screws, gears and other delicate parts are eliminated. A compensating spring takes up any difference between the bulb and room temperature and automatically resets the pen at the point on the chart corresponding with the bulb temperature.

New Burnishing Machine

A new type of motor-driven burnishing machine has been placed on the market by the Crown Rheostat and Supply Company, 1910 Maypole Avenue, Chicago, Ill., well known manufacturers of plating and polishing equipment. The new equipment is stated to have a number of features distinguishing it from other types of burnishing machines. It is said to be designed for economical operation as well as quality and quantity production. Simplicity of construction, capacity and length of life



Motor-Driven Burnishing Machine.

of the machine are stressed. Another feature is said to be its low maintenance cost. The machine is designed to occupy a minimum of floor space for its productive capacity. Ease of loading and unloading are other advantages claimed.

The machine can be placed in any convenient position regardless of the plant's belting system, having its own motor. The motor is located for directness of power transmission and is put in motion by the turn of a switch. Required floor space for the machine is 66 by 30 inches. Net weight is 600 pounds.

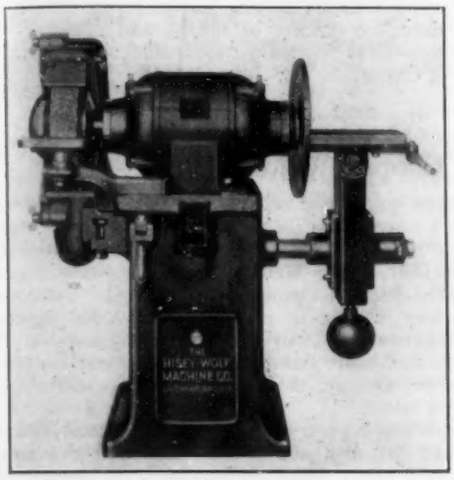
Aluminum Solder

An aluminum solder which is stated to be especially useful in foundries producing aluminum castings is manufactured by the Marshall Metal Company, 407 East Pico Street, Los Angeles, Calif. This company states that an increasing number of foundries are using their "Bulldog Aluminum Solder" for salvaging defective castings, and that this method of aiding production has proven extremely effective in reducing losses due to casting defects. Castings from permanent molds as well as sand molds and die castings can be repaired with the solder, it is stated, and in large runs of work it is claimed to save considerable expense by eliminating the necessity of re-casting. It is especially desirable, the makers state, where castings are large or very intricate, as the cost of molding is saved.

The aluminum solder, according to the manufacturer, produces a repair which can be machined as easily and as well as the casting itself. Application of the solder is said to be simple and can be accomplished by any ordinary mechanic. Experimental samples of the solder may be obtained by addressing the manufacturer at the address above. Stocks of the solder are kept at Chicago and New York, it is stated.

New Disc and Floor Stand Grinder

A new machine has been placed on the market by the Hisey-Wolf Machine Company, Cincinnati, Ohio, in the form of the combination disc and floor stand grinder illustrated here. This machine is furnished 3 phase operation on either 220 or 440 volts, 5 horsepower, 1,140 r.p.m., or, on special order, in 2 phase, 25, 40



New Type of Disc and Floor Stand Grinder.

or 50 cycle, to run 1,425, 1,125 or 1,425 r.p.m., respectively. It can also be furnished for special voltages from 110 to 550.

The machine has spindle of special steel, extra heavy in construction, mounted on two annular ball bearings which are subject to thrust loads only. A double-acting, self-aligning thrust bearing is provided to take all end thrust. Universal lever feed table is 8 by 14½ inches. Plain work table is 9½ by 10½ inches. Standard equipment includes one full safety combination wheel guard, 20-inch diameter steel disc, automatic safety motor starter, work table (either plain or universal, to order), and suitable connecting wires. Grinding wheels are furnished to special order only. Grinding wheel arbor is 1½ inches; spindle length, 42 inches; base at bottom is 20 by 21 inches; height from bottom of base to center of spindle, 36 inches.

Acid Pumps and Valves

A line of pumps and valves for acid handling and other corrosion service is manufactured by the Chemical Equipment Company, 2457 South Western Avenue, Chicago, Ill. This company states that it is serving the electroplating industry constantly with its products, which can be had in all metals and alloys which are machinable. In this line are included centrifugal and suction pumps of various types, both motor and belt-driven, automatic priming systems for acid pumps and a complete series of acid valves. The products are all sold under the trade name "Ceco."

The company states that because of the severe requirements in acid handling, the greatest care is necessary in securing perfect castings in the various metals used, and for this reason the company has an extremely rigid inspection routine. The men employed, it is stated, have all worked in chemical plants where the conditions under which corrosion-proof apparatus have been made apparent to them, so that they are well fitted to produce acid-handling equipment. A very liberal guarantee is furnished with "Ceco" products, according to the company.

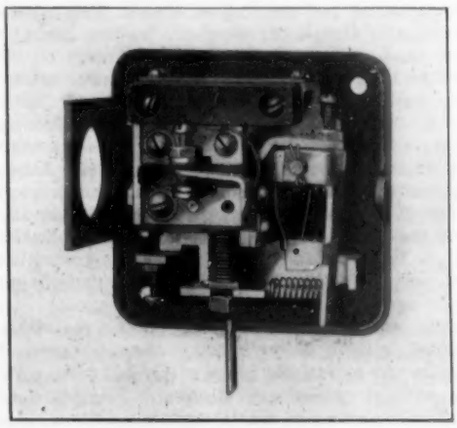
Brighteners for Plating Solutions

A line of brightening agents for electroplating solutions has been placed on the market by the E. Wambaugh Company, Goshen, Ind., manufacturers of chemical specialties for electroplaters. These brighteners are said to provide an economical aid to production, since they eliminate the necessity of color buffing after plating of certain types of work, which is produced with a high lustre by use of the brightener. The additions may be made to such plating solutions as copper, brass, nickel, cadmium, zinc and silver, the copper and zinc solutions necessarily being cyanide. The brighteners are sold under the trade names "Nickel Brite," "Copper Brite," etc., according to the solution for which it is made.

The brighteners are furnished for immediate addition to the solution. A pint of the brightener is added to 100 gallons of nickel solution for barrel plating, or 200 gallons of still nickel solution. One pint is added to each 100 gallons of all other solutions. The addition is calculated to last for several days' operation, after which brightener is again added if plate becomes dull. Simple instructions are provided and brighteners are guaranteed not to injure solutions to which they are added. The brighteners are sold in one, five and ten-gallon containers.

Thermostat to Control Heating Units

The General Electric Company, Schenectady, N. Y., announces the CR-2992-A-1 thermostat for use with industrial heating units where very close control of the heat is not required. The new device is available in three principal ratings, and the operating ranges are (1) 60 to 200 degrees Fahrenheit; (2) 150 to 300 degrees Fahrenheit, and (3) 250 to 400 degrees Fahrenheit. The



Thermostat for Control of Industrial Heating Units.

current-carrying capacity is 15 amperes at 115 or 230 volt alternating current, or ¼ ampere at the same voltages direct current. The thermostat will operate with a differential of 5% of the maximum temperature range.

The unit is mounted on a pressed-steel base which has two mounting holes and an upturned ear with an opening for a ¾-inch conduit. A drawn-shell cover, held in place by two screws, completes the enclosure of the switch. The cover and base are finished in black "Duco." Clearances between all live parts and ground are in accordance with underwriters' specifications. All steel parts are cadmium plated to resist corrosion. The silver contacts afford long wearing qualities, it is stated. The capillary tube consists of copper tubing of ⅛-inch outside diameter, having the bellows sealed on the switch end and the bulb on the immersion end.

Multicolor Airbrush

A new type of spraying apparatus, by means of which two, three or more colors can be applied at the same time, has been placed on the market by the Paasche Airbrush Company, 1909 Diversey Parkway, Chicago, Ill. The "Multicolor Airbrush" is shown in the accompanying illustration.

Multicolor Airbrush.

The new device is stated to consist of a multiple, convertible spraying head in which each color is controlled independently, so that colors may be applied at the same time or shut off at will. Spray can be from fine line to wide. Multiple heads in 40 different combinations are provided. The heads can be ganged by combining units of two, three or four, manually or air operated. All types of coating materials may be used at high speed, it is stated. Most of the parts of the new type equipment are interchangeable with older types of Paasche products.

Improved Tinning and Soldering Methods

By A. EYLES

When I read the short article under the heading, "Tin Compound to Prevent Rust," in the September, 1929, issue of THE METAL INDUSTRY, I was moved to write some additional information regarding the tin compound, as this material has been on the British market for at least five years. For about this length of time the writer has used it—not only with the viewpoint to prevent rust—but chiefly for its cleansing, fluxing and tinning properties for most metals, with the exception of aluminum and aluminum alloys.

The tinning compound is sold under the trade name of "Soldo" and the distributing agency for Great Britain is The Soldo Company, Sicilian House, Southampton Row, London. "Soldo," a Canadian invention, is a grayish-white powder consisting of tin and a combination of fluxes, which is claimed to be non-acid. In using the compound in soldering operations, all that is generally necessary is to heat the metal to be tinned or soldered to slightly above soldering temperature, and then sprinkle on a little of the powder. After melting is completed, wipe off, leaving perfectly tinned surfaces. In cases where rust or grease lie thickly on the surface of the metal, a little rubbing, with a tinned copper soldering iron or suitable steel tool will be found advantageous. There is no claim that this compound answers all tinning and soldering problems. The makers definitely exclude the worth of this compound for tinning aluminum or high-graphite cast iron. However, greasy, dirty, rusty, and, in some cases, even painted metal surfaces may be directly tinned with this compound without any preliminary cleaning, owing to the remarkable cleansing properties of the compound. A further claim is the very high penetration of the tin into the base metal, which also, no doubt, depends on the cleansing properties of the compound.

As to painted metal surfaces—while it is not claimed that these can always be tinned without a preliminary cleaning, even if anyone ever wanted to do so—an old piece of painted steel plate can be so treated without preliminary cleaning. With two or three applications of the powder and a little agitation with suitable tools, the surface is fluxed and a good tinning obtained. Moreover, although high-graphite cast iron may be excluded, this does not apply to all cast iron. It is possible to tin cast iron—the less graphite contained the more effective the tinning becomes. It is sometimes necessary to repeat the process in tinning cast iron.

Some four or five years ago, extensive tests on "Soldo" patent (British Patent No. 224048/23) were carried out by the National Physical Laboratory of Great Britain, which confirmed, in general, the moderate claims of the manufacturers of this compound. The writer says "moderate," since there is no claim that this compound is a panacea for all tinning and metal jointing problems. The makers definitely exclude (as previously stated) the efficacy of this compound for tinning aluminum or high graphite cast iron, and those who are aware of the metallurgical difficulties in tinning or soldering both these metals, will, on this limitation, be better prepared to accept the claims that are made. By means of "Soldo" compound, the following metals were effectively and readily tinned in the tests at the National Physical Laboratory, Teddington, England: phosphor-bronze, manganese-bronze, steel, cast iron and Ohmal (nickel 3.5, manganese 9.0, copper 87.5 per cent). Microscopical examination of the joints showed interpenetration between the base metal and tin in all cases. With manganese-bronze the extent of the interpenetration has been observed to be four to five times, and with phosphor-bronze approximately twice as great as when an ordinary workshop method of tinning was employed. With steel, the relative extent of interpenetration using "Soldo" and an ordinary workshop method were respectively equal. Effective tinning of severely rusted steel and rusty cast iron has also been accomplished by means of "Soldo," the rust being removed and interpenetration between tin and steel or iron obtained, thus illustrating the valuable cleansing properties of the compound.

It is obvious that the tinning compound meets a long felt want in all metal-using trades; but not solely to prevent rust, as cadmium and zinc coatings are better rust proofings; but for the tinning and retinning of machinery and automobile bearings, tinning and soldering of galvanized products and pipe line fittings its cleansing, fluxing and tinning properties are of a notably high order, enabling preliminary cleaning of the metals to be tinned to be dispensed with and giving high penetration of the tin into inaccessible parts with high intercrystalline penetration.

Judging by the results achieved, this tinning compound should not only simplify many ordinary tinning and soldering jobs, but will doubtlessly extend the practice of tinning and soldering to many jobs that have hitherto resisted the application of the known methods of effective tinning.

New Copper Welding Process

Widespread interest was caused at Swansea, Wales, recently by a demonstration of a new process for welding copper. The demonstration was given by the Premier Electric Welding Company, at the works of British Copper Manufacturers, Ltd., subsidiaries of Imperial Chemical Industries combine in England. Until recently the satisfactory welding of copper was regarded as impossible; the high thermal conductivity of the metal gave rise to practical difficulties, and, apart from these, it was found that the copper became brittle through the action of the gases in the acetylene flame, it is stated.

At the demonstration, copper pipes and copper sheets were welded together, and flattening and bending tests of the former showed that the weld could withstand conditions of service as satisfactorily as the pipe itself, while the welded sheets could withstand as much work and stretching as could be expected from the solid copper. The welding of varnish pot seams was also demonstrated. It is considered that the process will largely replace riveting and that by welding sections together it will be possible to build up vessels which previously had to be forged out of solid copper.

These results have been obtained by slight modifications in the technique of welding ferrous metals. The copper which has been developed for the welding purposes is a modification of the tough pitch variety, which is not attacked by the gases of the acetylene flame, and the filler rod is also of specially modified copper, which is very fluid when molten and thus runs well into the joint, leaving no air locks or gaps, it is claimed. The flux used is of an appropriate type to hinder the formation of scale on the red-hot copper, as scale prevents metallic contact. A. C. B.

Aluminum Flux

A number of advantages of distinct value to founders and melters of aluminum are claimed for "Apex" aluminum flux, manufactured and distributed by the Apex Smelting Company, 2554 Fillmore Street, Chicago, Ill., distributors of virgin aluminum, and manufacturers of aluminum alloys. The company states that the flux it manufactures cleanses the bath of molten aluminum of foreign substances, dispels gases and oxides, brings to the surface pot or furnace scale, entrapped drosses, etc., and liberates metallic aluminum from skimming. It is claimed that the flux produces smooth, even, bright surfaces on castings, resulting in high lustre upon polishing. Physical properties, it is stated, can be improved and the flux is smokeless, odorless and fumeless, while absorbing no moisture. Two to four ounces per 100 pounds of metal is required. It is best used by placing in bottom of pouring ladle and hot metal poured over it, but can also be used in furnace or melting pot like ordinary fluxing agents. It is sold in 50, 100 and 500 pound lots.

Non-Blushing and Buffing Lacquers

In an item appearing in this section of our May issue, there appeared an item under the heading "Brushing and Buffing Lacquers," describing products of the Agate Lacquer Manufacturing Company, 11-13 Forty-third Road, Long Island City, N. Y. The heading and text were incorrect; the proper terms should have been "non-blushing and buffing lacquers," which are the company's chief products.

Equipment and Supply Catalogs

Isolation. Korfund Company, Inc., 235 East 42nd Street, New York City. Publication on sound-proofing of buildings and isolation of machine vibration.

Pickling-Tank Temperature Control. The Weaver Brothers Company, Adrian, Mich. Illustrated leaflet on Foxboro temperature control instrument installations.

Electric Motor Bargain Bulletin. The Fuerst-Friedman Company, 1292 East 53rd Street, Cleveland, Ohio. May, 1930, issue of a catalog of rebuilt electrical equipment.

Aluminum Alloy Castings. The British Aluminum Company, 122 East 42nd Street, New York. Illustrated booklet on a subject of interest to all aluminum founders.

Brown Electric Flow Meters. The Brown instrument Company, Philadelphia, Pa. Instructions for installation and care of electric flow meters, No. 214. A very comprehensive handbook.

Arc Welding Data. Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Nos. 12 and 13; part of a series of publications on arc welding, presenting latest developments.

Hastings County, Ontario. Natural resources Intelligence Service, Department of Interior, Ottawa, Canada. A large report with special reference to the resources and industries of the country.

Safety Competition. Policyholders Service Bureau, Metropolitan Life Insurance Company, New York City. Industrial safety pamphlet No. 7, on "Methods of Stimulating Interest through Contests."

South Bend Lathes. South Bend Lathe Works, South Bend, Ind. Bulletin 18, describing the company's new 1930 model 18-inch lathe; 16 pages, illustrated. Also, **Hand Book No. 33,** for auto mechanics.

Automatic Boiler Feed. R. E. Lovekin Corporation, 34 South 17th Street, Philadelphia, Pa. Catalog Unit 4 issued by Mears-Kane-Ofeldt, Inc., Philadelphia; on equipment for maintaining constant water level in high or low pressure boilers.

Open Letter to U. S. Senators and Congressmen. Merchant and Evans Company, Philadelphia, Pa. A large booklet presenting a case between the Merchant and Evans Company and the United Gas Improvement Company, before the Federal Trade Commission.

Southwark-Emery Testing Machines. Southwark Foundry and Machine Company, 400 Washington Avenue, Philadelphia, Pa. Illustrated handbook and catalog on metal testing machinery of various kinds. Contains a variety of technical information on the subject.

After 50 years, Ajax Still Shows the Way. The Ajax Metal Company, Philadelphia, Pa. Interesting brochure on the company's fiftieth anniversary. Reviews its history and the many developments with which it has been connected. A beautifully illustrated booklet.

Laboratory Vitreosil. The Thermal Syndicate, Ltd., 58 Schenectady Avenue, Brooklyn, N. Y. Excellent illustrated brochure presenting in detail the available data concerning fused silica and fused quartz and describes various applications of these materials in industry, research and analysis.

The Product with a Background. Norton Company, Worcester, Mass. A large, handsome brochure on grinding wheels, beautifully illustrated and printed. The many pages are reprints of the company's industrial advertising, notable for excellent presentation of the company's products.

Thermal Analysers and Differential Dilatometers. The R. Y. Ferner Company, Investment Building, Washington, D. C. Illustrated booklet on Chevenard apparatus for observing the reactions of metals to high temperatures. The catalog should be of interest to metallurgists and other research workers.

Foundry Equipment. The American Foundry Equipment Company, Mishawaka, Ind. Interesting circular on improvements in sand conditioning, dust arresting, sand preparing and sand blasting. Covers the company's developments in the past year; issued for the foundry convention at Cleveland.

Copperweld Wires and Strands. Copperweld Steel Company, Glassport, Pa. A series of bulletins on strength standards for "Copperweld" products, which have been raised, the company states, through the adoption of electric furnace steel for the manufacture of the wire. Includes a table of data on "Copperweld" wire and strand.

Venturafin Method of Heating. American Blower Corporation, Detroit, Mich., and Canadian Sirocco Company, Ltd., Windsor, Ont., Canada. A 24-page illustrated brochure on unit heaters for floor, wall or ceiling mountings and for high, medium or low pressure steam applications. Contains complete technical details of the product.

Nielsen Surveys. A. C. Nielsen Company, Chicago, Ill. This company has issued the following: Nielsen Survey Index for March; Surveys of Use of Thwing Pyrometers in Plant of National Bearing Metals Corporation, and in Plant of Elliot Company; Survey of Use of Monel Metal for Pump Rods and Other Equipment by Fox River Paper Company; Survey of Use of Colorized Tubes in Dubbs and Cross Stills by Indian Refining Company. Full information in regard to these surveys can be obtained from the Nielsen Company.

Hows and Whys of Soap. The Cowles Detergent Company, Cleveland, Ohio. No. 6 of "Cowles Comments," a discussion to promote scientific cleansing of metals. The company says: "An effort has been made in all 'Cowles Comments' to present only such material as will be useful to a practical understanding of the question being discussed. There is always much other data of a highly technical type which, while interesting to a chemist, is not essential to the practical study of a question of chemistry by those who want the usable, working facts primarily. This article, while devoted solely to 'Soap,' should not be construed as a recommendation that soap is a necessary part of all cleaners, for such is not always the case."

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Society for Testing Materials

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

Annual Meeting, June 23 to 27

The annual meeting of the American Society for Testing Materials will take place June 23 to 27, inclusive, at the Chalfonte-Haddon Hall, Atlantic City, N. J.

Technical Features

A few of the major features of the program are indicated below:

Aircraft Materials.—Through the efforts of a committee under the chairmanship of Mr. H. C. Knerr, functioning in an advisory capacity to the Committee on Papers and Publications, a very excellent program has been arranged for the Symposium on Aircraft Materials. Seventeen papers have been secured, each one briefly summarizing the present knowledge on some phase of the properties or testing of aircraft materials. These cover not only the materials for the structural members but also the materials entering into aircraft engines, including engine failures and the causes thereof.

Non-Ferrous Metals.—The Society is again fortunate in

having an excellent array of papers in the non-ferrous field. Special mention should also be made of a revision of Campbell's List of Alloys that is being sponsored by Committee B-2 on Non-Ferrous Metals and Alloys. This list has not only been amplified in respect to the listing of compositions but also includes the physical properties of a number of the more important alloys.

Corrosion and Corrosion-Fatigue.—Several papers on the program deal with corrosion, fatigue, and corrosion-fatigue of metals. In addition a report is being presented summarizing the progress during the year in fatigue testing. The Society's Committee A-10 on Iron-Chromium, Iron-Chromium-Nickel and Related Alloys plans to bring up to date the data on corrosion-resistant alloys presented in connection with the symposium held in 1924.

Nominations for Officers

The following nomination for officers are announced:

For President:

K. G. Mackenzie, Consulting Chemist, The Texas Company, New York City.

For Vice-President:

Cloyd M. Chapman, Consulting Engineer, New York City.

For Members of Executive Committee:

F. H. Jackson, Senior Engineer of Tests, U. S. Bureau of Public Roads, Washington, D. C.

Zay Jeffries, Consulting Metallurgist, Aluminum Company of America, Cleveland, Ohio.

H. H. Quimby, Consulting Bridge Engineer, Philadelphia, Pa.

G. A. Reinhardt, Director of Metallurgy and Research, Youngstown Sheet and Tube Company, Youngstown, Ohio.

H. N. Van Deusen, Materials Engineer, Bell Telephone Laboratories, New York City.

Dudley Medal to Metallurgists

The fourth award by the Society of the Charles B. Dudley Medal for meritorious papers on research in engineering materials went to three metallurgists this year: J. R. Townsend, W. A. Straw and C. H. Davis, joint authors of the paper entitled "Physical Properties and Methods of Test for Some Sheet Non-Ferrous Metals," presented at the 1929 annual meeting.

Committee B-1 on Copper Wire

Committee B-1 on Copper Wire, at a meeting in New York City on April 19, approved a Specification for Grooved Trolley Wire for Mine Service which will be recommended to the Society in June for publication as a tentative standard. The Society, through Committee B-1, began its work on copper wire with the issue of specifications for hard-drawn wire in 1909. In later years it was found possible to interest the American Electric Railway Association in the subject of Trolley Wire, but progress in standardizing was slow, until about five years ago, since which time the matter of Trolley Wire for railway service has been brought to joint standardization by the two societies.

American Electroplaters' Society

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

Hartford-Connecticut Valley Branch

HEADQUARTERS, CARE OF V. E. GRANT, 43 PUTNAM STREET, BRISTOL, CONN.

Annual Educational Session and Banquet

The Hartford-Connecticut Valley Branch of the American Electroplaters' Society held its annual educational session and banquet on May 10, at the Bond Hotel, Hartford.

The educational session was opened by Joseph Beloin, president of the Branch, who made a short address. The presiding officer of the session was E. L. Wood. The following papers were heard:

Stainless Steel and Iron Manufacturing, Properties and Uses, by R. P. Devries, Metallurgist, Ludlum Steel Company, Watervliet, N. Y.

Abrasives for Polishing and Finishing Stainless Steel and Iron, by A. A. Klein, Research Engineer, Norton Company, Worcester, Mass.

Lacquers, by E. M. Hayden, Works Manager, Stanley Chemical Company, East Berlin, Conn.

Ladies Entertained

While the educational session was in progress, the ladies were having a variety of entertainment, prepared by the Hartford ladies for the visitors. This included driving, shopping, cards, etc., as preferred.

The banquet in the evening was a fine event, a good orchestra providing the music and some New York and Boston vaudeville artists giving good entertainment. There were two hundred persons at the banquet. The committee that arranged the banquet consisted of H. R. MacFadyen, chairman; Tennant Elwin, W. D. MacDermid, F. J. Clark and Vernon E. Grant.

Newark Branch

HEADQUARTERS, CARE OF G. REUTER, BOX 201, NEWARK, N. J.

Open Meeting

The Newark Branch of the American Electroplaters' Society held an open meeting on May 16, at Franklin Hall, Newark, at which several important speakers were heard. The following papers were presented:

Throwing Power of Cyanide Copper Solutions, by Dr. L. C. Pan, Instructor, College of the City of New York.

Rapid Analysis of Silver Solutions, by William Hauberstrat, associate of Dr. Pan.

Metal Colors, by John Levardsen, Viking Lacquer and Chemical Company, Long Island City, N. Y.

Metal Finding Manufacturers

HEADQUARTERS, CARE OF H. R. BARKER, FULFORD MANUFACTURING COMPANY, PROVIDENCE, R. I.

Annual Meeting

The Metal Finding Manufacturers' Association held its annual meeting on May 7, at the Providence-Biltmore Hotel, Providence, R. I. Frank E. Farnham was re-elected president; the other officers are: Ralph Gregory, vice-president; Edgar E. Baker, secretary; William G. Lind, treasurer. Harold Baker who acted as secretary while the association was being organized, could not continue in that office due to pressure of business.

Several items of business were discussed, among them the subject of credit terms in the trade, formation of an information bureau to which accounts more than 60 days overdue would be reported, such firms to be placed on a C. O. D. list. Another project of the Association has been the adoption of a code of ethics; also, rules for regulation of a practical credit system.

W. H. M.

Non-Ferrous Ingot Metal Institute

HEADQUARTERS, 308 WEST WASHINGTON STREET, CHICAGO, ILL.

Second Annual Meeting

The second annual meeting and outing of the Non-Ferrous Ingot Metal Institute was held at French Lick, Ind., April 28 to 30. The principal business transacted was a review of the work which had been accomplished during the preceding twelve months and the approval of comprehensive plans for a program of technical research. The Institute is cooperating with the American Society for Testing Materials to formulate standards for specifications for ingot brass and bronze. Reports were received and approved resulting in the financing by the Institute of a research associate at the United States Bureau of Standards

for the purpose of making an exhaustive investigation into the physical properties of ingot brass and bronze.

The officers of the Institute were unanimously reelected. They are: president, Benjamin Harris; vice-president, Isadore Glueck; treasurer, Lazarus Chapman; R. D. T. Hollowell was reelected secretary manager.

National Metal Congress

HEADQUARTERS, 7016 EUCLID AVENUE, CLEVELAND, OHIO

Floor plans of the twelfth annual National Metal Exposition which will be held at the Stevens Hotel in Chicago, September 22-26, 1930, inclusive, have been mailed to prospective exhibitors.

The facilities of the Stevens Hotel will provide a beautiful setting for the 1930 exposition. For the first time all the activities will take place under one roof. Technical sessions and other features of the Congress will all be held in the Stevens Hotel.

The 1930 show will cover approximately 75,000 square feet of floor space. On the first floor of the hotel, in the great exhibition hall and foyer, will be set up the heavy displays. Second floor exhibits will be located in the grand ball room and its foyer, and in the lounge, writing room and main dining room of the hotel. No restrictions are imposed by the exposition management as to the showing of heavy machinery, whether or not in operation.

A unique feature of the exposition is its all-expense cost to exhibitors, a new departure in show management. The exhibitor's booth rental includes cost of cartage to and from the railroad terminals; erection and dismantling of exhibits; the installation of connections for gas, electricity, air and water as well as the cost of the current, gas, etc., used; furniture, carpenter work, signs and other charges hitherto paid separately by the exhibitors. Rental costs per square foot vary with the requirements of the individual exhibitor.

—W. H. EISENMAN, Director.

Ornamental Iron and Bronze Makers

HEADQUARTERS, 1331 G STREET, N. W., WASHINGTON, D. C.

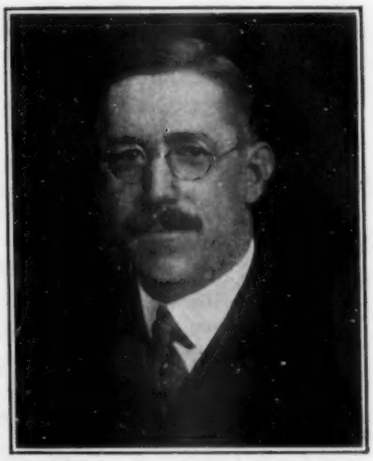
The National Association of Ornamental Iron and Bronze Manufacturers will hold its annual convention at the Southern Hotel, Baltimore, Md., in October. Plans have already been started for the convention by Thomas R. Charshee, executive secretary of the organization.

Personals

N. K. B. Patch

Nathaniel K. B. Patch, secretary of the Lumen Bearing Company, Buffalo, N. Y., widely known in the brass foundry industry both through his business connection and his activity in the American Foundrymen's Association, has been elected president of that society, as stated in the article on page 280 of this issue.

Mr. Patch has been in the foundry industry since his graduation from Massachusetts Institute of Technology, Boston, Mass., over thirty years ago. Born in Buffalo, he went to grammar and high school there, then went to the technology school mentioned. He became identified with the Lumen Bearing Company in 1900, when that company was organized, and spent four years as a salesman for the firm. In 1904 he became manager of the Lumen company's Canadian plant. Later he was promoted to the position of general superintendent of the company's Buffalo plant. He occupied this position until he was again promoted, this time to works manager, from which office he retired in 1923, due to the misfortune of failing eyesight. He became secretary and advertising manager of the company then, and has continuously filled this position since.



N. K. B. PATCH

Always interested in the technical development of his industry, Mr. Patch has been an active factor in various brass and foundry organizations. He was one of the organizers of the American Brass Founders' Association, of which he was one on the first directors, and, in 1911, president. In the American Foundrymen's Association he has been identified with many committees. He was chairman of the Committe on Non-Ferrous Metals of the American Society for Testing Materials for some time. Previous to his election to the office of president of the Foundrymen's Association he was a director of it, having served from 1926 to 1929. Mr. Patch enters his new office in the Association with the distinct approval and gratification of all of its members, being known as an active leader and a wise executive.

Charles Hardy, president of Charles Hardy, Inc., New York, dealers in metals and ores, has returned from a trip through Europe.

Jordan Korp, metallurgical engineer of the Leeds and Northrup Company, Philadelphia, Pa., is in Europe on a three-month tour of heat treating plants.

Dr. Robert J. Anderson has resigned as vice-president and director of the Fairmont Aluminum Company, Fairmont, West Va., and will announce his future plans shortly.

E. A. Doyle, consulting engineer of the Linde Air Products Company, New York, was elected president of the American Welding Society at the annual meeting April 25th.

G. H. Clamer, president and general manager of the Ajax Metal Company, Philadelphia, Pa., will deliver a paper on "Non-Ferrous Ingot Metals" at the annual convention of the National Association of Purchasing Agents, at the Hotel Stevens, Chicago, Ill., on June 18.

L. W. Thelin, assistant metallurgist of the Chase Metal Works, Waterbury, Conn., presented a paper by D. K. Crampton, metallurgist of that company, on The Manufacture and Testing of Brass," before a meeting of the New Haven, Conn., chapter of the American Society for Steel Treating, on April 17th.

Howard J. Rowe, of the Aluminum Company of America, Cleveland, Ohio, addressed a meeting of the Quad-City Foundrymen's Association, at the Fort Armstrong Hotel, Rock Island, Ill., on April 14th. His subject was "Stronger Aluminum Castings by Improved Foundry Practice," which he presented also at the convention of the American Foundrymen's Association last month.

Leslie C. Whitney has been appointed chief metallurgist of the Copperweld Steel Company, Glassport, Pa. He was formerly for five years assistant head of the physical laboratories of one of the country's largest wire manufacturers, it is stated. The Copperweld company is at present equipping chemical and metallurgical laboratories with the latest types of apparatus for control and research work.

Tom S. Wills has been appointed assistant sales manager of the U. S. Stoneware Company, 50 Church Street, New York City. Mr. Wills is the son of Frank S. Wills, president of the U. S. Stoneware Company. He will make his headquarters at the New York offices and will specialize in the sale of U. S. Stoneware chemical equipment. Mr. Wills has had a thorough training in ceramics. For some time he was assistant superintendent of the company's Plant No. 1, at the Akron, Ohio, works. He is a graduate of Culver Military Academy and has also attended Ferris University.

John Enequist, one of the founders, now retired, of the firm of Seldner and Enequist, Inc., Brooklyn, N. Y., chemical manufacturers, was forced to return hurriedly from Europe last month due to the death on May 11th of his former

partner, **Rudolph Seldner,** with whom in 1902 he founded the firm bearing their name. While no longer active in the business, Mr. Enequist still takes an interest in it, according to his son, **John Enequist, Jr.,** who has taken his place.

William L. Whitson, president of The Matchless Metal Polish Company, Glen Ridge, N. J., has returned with Mrs. Whitson from an extended tour of the Orient. In Japan, they were entertained by **J. McDonald Smith,** head of the A. P. Munning and Company plant there. At los Angeles, where they stopped en route, they were entertained by **O. M. Worthington,** of the Universal Chemical Company, and by **George W. Kyle,** of the L. H. Butcher Company. They stopped off at Honolulu, Hawaii. On the way home, Mr. Whitson stopped at Chicago for two weeks to visit the Matchless company's plant there. The entire trip lasted from December 14, 1929, to May 16, when Mr. Whitson returned to Glen Ridge.

Obituaries

William G. Wherry

William G. Wherry, president of the Skillman Hardware Manufacturing Company, Trenton, N. J., died at his home, 10 Belmont Circle, Trenton, on April 28, 1930, after a lengthy illness. He was 47 years old. Despite his poor health he had taken an active part in business until six weeks ago. He was also president of the Wherry and Hutchinson Electrical Supply Company, Trenton, and a member of the Board of Education of that city.

WILLIAM G. WHERRY.

Born in New York, Mr. Wherry was educated for the Episcopal ministry and was a graduate of Trinity College, Hartford, Conn., and of General Theological Seminary, New York. He went to Trenton in 1910 as rector of St. James P. E. Church and served there until 1912. He resigned from the ministry in 1912 to become associated with the late E. V. D. Skillman in the Skillman Hardware Company. He had previously married Miss Addie V. D. Skillman, daughter of the head of that concern.

After leaving the ministry, Mr. Wherry continued his active interest in church work. He served until his death as a member of the vestry of All Saints P. E. Church. Mr. Wherry was appointed to the Trenton School Board in 1922 and served as president from 1923 to 1926.

Mr. Wherry was a director of the Chambersburg Trust Company, and was also connected with the Manufacturers Council, Chamber of Commerce, Rotary Club and the Trenton Country Club. Surviving him are his wife, two children, John and Elizabeth, and four sisters. The interment was in Ewing Church Cemetery, Trenton.

George P. Gerlinger

George P. Gerlinger, 59, president of the Gerlinger Brass and Aluminum Foundry Company, Milwaukee, Wis., died at his home in that city on May 14, 1930. A native of Marysville, Kan., Mr. Gerlinger came to Milwaukee thirty years ago and established himself with his brother, W. E. Gerlinger, in the foundry business. His mother, Mrs. Elizabeth Gerlinger, died four weeks before her son, and his brother died last November. His widow, Mrs. Bertha Gerlinger, and one son, Walter, are the near survivors.

—A. P. N.

Rudolph Seldner

Rudolph Seldner, treasurer of Seldner and Enequist, Inc., Brooklyn, N. Y., manufacturers of chemicals and adhesives, died on May 11, 1930, after a long illness. He was fifty-eight.

Mr. Seldner joined John Enequist in the formation of the chemical concern bearing their name, in 1902. They had very limited capital, but by perseverance and constant effort, they built up an industry which is now rated at around half a million dollars, according to John Enequist, Jr., son of the founder. Previous to his entry into the business, Mr. Seldner had been a teacher of Chemistry at Columbia University. For a short time, also, he had been interested in acetic acid manufacture at Glens Falls, N. Y.

Mr. Enequist, who is survived by his widow, was known by his colleagues as an exceedingly charitable man. He left only a small fortune, having disposed of the largest part of his means during his lifetime, contributing to many charities without regard to race or religion.

John H. Hurlbut

John Henry Hurlbut, treasurer and general manager of the Plume and Atwood Manufacturing Company of Waterbury and Thomaston, Conn., died at his home on Waterville Street, Waterbury, on May 10, 1930. Death came as the result of a cerebral hemorrhage. He was born in Winchester, Conn., August 1, 1864, the son of George and Edice (Hamilton) Hurlbut, was educated in Hartford schools, and entered the employ of Plume and Atwood's as a bookkeeper when he was 23 years old.

Largely through his efforts the company became one of the most efficient and prosperous industries in the state. He had been treasurer and general manager of the company for more than 30 years. He was also a director of the American Ring Company and the Colonial Trust Company of Waterbury.

He is survived by his widow, Annie B. Hurlbut; one son, Gordon B. Hurlbut; a daughter, Helen B. Hurlbut; a brother, Charles F. Hurlbut, and two grandsons, Gordon B., Jr., and John Henry Hurlbut 2nd. The funeral was held in Waterbury May 13th with burial in Riverside cemetery in that city. W. R. B.

John P. Durfee

John Pierce Durfee, vice-president of the Waterbury Brass Goods Corporation, subsidiary of the American Brass Company, died at his home in Waterbury, Conn., May 21. He was 65 years of age, born in New York City, the son of John P. and Harriet A. (Underwood) Durfee. He was educated in the public schools of that city and after several years in an insurance office came to Waterbury in 1907 and entered the employ of the Waterbury Brass Goods Corporation. He became sales manager, and in 1911 was made a director of the company and its secretary.

Mr. Durfee is survived by his wife, formerly Miss Charlotte D. Holzderber of New York; one son, Charles Pierce Durfee; and three grandsons, John Pierce Durfee 3rd, Charles Miller Durfee, and Ralph Hebert Durfee, all of Waterbury. W. R. B.

Charles E. Young

Charles Eckert Young, vice-president of the Imperial Brass Manufacturing Company, Chicago, Ill., died suddenly on April 27, 1930, at his residence, 731 Vine Avenue, Park Ridge, Ill. He was fifty-two years old.

Mr. Young was connected with the brass industry for many years and was well known in the midwest. Born in Chicago in 1878, he grew up there and was at one time a director of the Ohio Brass Company, Mansfield, Ohio, but later returned to Chicago to start an advertising agency. In 1915 he again went to the brass industry, joining the Imperial Brass Manufacturing Company, of which he was vice-president in charge of its Watrous plumbing division.

News of the Industry

Industrial and Financial Events

Anaconda Copper Mining Company

Anaconda Copper Mining Company, Anaconda, Mont., and subsidiaries reports net income for 1929, $69,115,728 after all taxes, depreciation, proportion accruing to minority interests, and charge-offs for discount and interest on bonds. This compares with $24,174,780 for 1928. The large increase in income is stated to reflect the 18c price of copper that prevailed during most of 1929. The company's statement in part is as follows:

Copper Production

"Copper production was 990,569,463 pounds, of which 297,014,107 pounds was produced from the Butte mines, 162,663,775 pounds by Andes Copper Mining Company, 299,575,752 pounds by Chile Copper Company, 58,826,951 pounds by Greene Cananea Copper Company and 172,488,878 pounds by International Smelting Company. One hundred eighty-eight million fifty thousand nine hundred fifty-four pounds was produced from custom ores and ores treated on toll, leaving production from company's own mines of 802,518,509 pounds. This is equivalent to 18.8 per cent of world production as reported by the American Bureau of Metal Statistics.

Zinc and Lead Production

"The electrolytic zinc refineries at Anaconda and Great Falls produced 273,357,416 pounds. Lead production at Tooele, Utah, was 152,536,672 pounds.

Fabricated Metal

"The fabricated metal output of the American Brass Company and Anaconda Wire and Cable Company was 1,050,054,045 pounds. Of this amount 695,059,213 pounds was shipped by the American Brass Company and 354,994,832 pounds by Anaconda Wire and Cable Company. The latter is a new subsidiary of Anaconda, organized in February of last year to take over the Great Falls rod and wire mill of Anaconda and the Kenosha wire mill of the American Brass. It also acquired the assets and business of the Inland Wire and Cable Company Tubular Woven Fabrics Company, Maring Wire Company, Marion Insulated Wire and Rubber Company and the Hastings Wire and Cable Corporation."

Anaconda Wire and Cable Company

The Anaconda Wire and Cable Company, New York, has acquired the assets of the California Wire and Cable Company, which has plants at Oakland and Orange, Calif. The Anaconda will operate both plants as its Pacific Coast units. The acquisition gives the Anaconda subsidiary a string of plants from the Atlantic to the Pacific coasts, producing a variety of copper wire and cable which is sold through the General Electric Supply Corporation, in which Anaconda has been interested for over ten years.

Scovill Manufacturing Company

Reports from Waterbury, Conn., indicate that the Scovill Manufacturing Company there will start construction on two new factory buildings shortly. It is stated one of the buildings will be 300 by 100 feet and cost about $350,000. The other is expected to cost about $100,000, but definite plans for it are not given. Expansion is stated to have been made necessary by the acquisition of the A. Schrader & Sons plant at Brooklyn, N. Y.

Aluminum Limited Issues Stock

Aluminum Limited, formed in 1928 to acquire from the Aluminum Company of America certain of its properties outside the United States, has just floated an issue of $13,000,000 of 6% cumulative preferred stock of $100 par value. The company's operations are in Canada, Norway, England, Switzerland, Germany, Italy, India and other countries, it was stated in conection with the issuance of the stock. It owns extensive bauxite deposits and has smelting plants in Canada, Norway and Italy. Fabricating plants are in Canada, Germany, England, Switzerland and India. Proceeds of the new issue wil be used to pay current indebtedness incurred through expansion of interests; to expand manufacturing facilities; and for other corporate purposes.

Copper Consumption Lower

A decline of approximately 25,000 tons in the consumption of copper in the first quarter of 1930 as compared with the corresponding three months of 1929 is reported by the American Bureau of Metal Statistics, New York. Consumption for the first three months this year by the four major copper consuming industries, electric, automobile, building and export manufactures, totaled approximately 103,300 short tons.

The following table shows the consumption of copper in short tons as reported by the bureau:

	Electric M'f'res	Auto-mobiles	Build-ings	M'f'res for Export
1930:				
First quarter	53,000	24,000	11,000	15,300
1929:				
First quarter	52,000	37,000	15,500	22,300
Second quarter	70,000	44,000	13,000	17,300
Third quarter	68,000	35,000	16,500	17,800
Fourth quarter	71,000	19,000	14,000	16,200
Total	261,000	135,000	59,000	73,600

American Brass Company Expansion

The American Brass Company, Waterbury, Conn., will expend $400,000 to $500,000 for an addition to its south plant on the Naugatuck River, at Waterbury. Piles are being driven on the site.

The addition will house the machinery now in the plant of the Randolph-Clowes Company, which was acquired by the American Brass Company during the past year. The equipment is for manufacture of large tubing, which the American Brass Company has had difficulty manufacturing with its own machinery. The new addition to house it will be 200 by 160 feet, one-story, brick and steel, with saw-tooth roof. Four months' work will be required to construct it.

Munning and Munning, Inc.

Munning and Munning, Inc., a new firm formed recently at Philadelphia, Pa., as announced in our previous issue under "Business Items—Verified," is now in full operation as a manufacturer and distributor of electroplating, buffing, and polishing apparatus and supplies. The firm's address is Memphis and Tioga Streets, Philadelphia, Pa.

The new company offers, according to its announcement to the trade, a complete service to platers and polishers, as well as competent advice with a view to producing economical results in finishing shops and departments.

Roessler and Hasslacher Outing

One hundred and sixty employees of the Roessler and Hasslacher Chemical Company, New York, attended the company's annual outing, held on Saturday, May 24, at Narragansett Inn, Lindhurst, L. I. The varied program included baseball, races, tug-of-war, luncheon and dinner, and a short address by Milton Kutz, executive vice-president in charge of the company's New York office. All branches of the company in and about greater New York were represented.

New York Air Show

The New York Aircraft Salon, sponsored by the Aeronautical Chamber of Commerce of America, Inc., was held at Madison Square Garden, New York City, May 3 to 10. The exhibition was extensive, including a large number of complete planes of various types, as well as many exhibits of parts, accessories, raw materials, etc. Many special features marked the week of the salon, these including the appearance of many famous aviators; the dirigible "Los Angeles" over New York, together with the metal-clad dirigible ZMC-2, which flew over New York and vicinity; addresses by aviation people and others; and numerous other events.

Of interest to the metal and finishing trades were the many uses to which both metals and finishes have been put in the aviation industry. Naturally, aluminum and other light alloys abound in this field. However, other non-ferrous metals are also used considerably, and the finishes are very numerous, including electroplate, lacquer, paint, varnish and others. The following companies exhibited products of interest to the metal and finishing industries:

Aero Supply Company
Aluminum Company of America
Bendix Aviation Corporation
Bendix Brake Company
Bendix-Stromberg Carburetor Company
Buhl Stamping Company
Edo Aircraft Corporation
Egyptian Lacquer Company
Hamilton Standard Propeller Corporation
Imperial Brass Company
International Nickel Company, Inc.
Light Manufacturing Company
Metallurgical Laboratories, Philadelphia, Pa.
Paramount Aluminum Welded Products
Parker Appliance Company.

Beam-Knodel, Inc., to Sell Plating Supplies

Beam-Knodel, Inc., 199 Lafayette Street, New York City, has been organized and will open a store at that address June 10, to carry a complete supply of electroplating and polishing equipment and supplies manufactured by the Hanson-Van Winkle-Munning Company, Matawan, N. J. Beam-Knodel will distribute these products in the New York metropolitan and surrounding districts. The company states it is prepared to give estimates on complete plating plants.

The proprietors, H. F. Beam and J. J. Knodel, have represented Hanson-Van Winkle-Munning Company in the New York and other territories for a number of years. They state the object of forming the new company is to facilitate more prompt deliveries.

Copper and Nickel in Broadcasts

The Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa., during May honored two large metal industries—copper and nickel. On May 6, using a national radio network, the company gave a "Salute to Copper," with R. L. Agassiz, president of the Copper and Brass Research Association, as speaker. On May 27, a "Salute to Nickel" was given, again over a coast-to-coast network of radio broadcasting stations, with A. J. Wadhams, manager of development and research for the International Nickel Company, as speaker.

Corporation Reports

Winchester Repeating Arms Company and subsidiaries, $440,306 net loss for 11 months to December 31, 1929, after charges, taxes, etc.

Revere Copper and Brass, Inc., New York, net profit for three months ended March 31, 1930, $319,158 after charges and taxes.

General Cable Corporation, New York, for three months to March 31, 1930, net loss of $487,253 after charges and taxes, as against $1,024,971 net profit in first quarter of 1929.

New Jersey Zinc Company voted an extra dividend of 50 cents a share, payable June 10 to holders of record May 21, 1930.

Bridgeport Brass Company

The resignation of Charles E. Beardsley as president and also director of the Bridgeport Brass Company, Bridgeport, Conn., was presented on May 27th to the board of directors and was accepted. Ralph E. Day was elected to fill the vacancy in the office of president and will also retain his title and functions of general manager. Mr. Day is a director of the company and has held the office of vice-president. Prior to joining the Bridgeport Brass Company in the early part of 1928, Mr. Day had been with the American Brass Company for 22 years, first in Waterbury, Connecticut, and later as manager of their plant at Hastings-on-the-Hudson, N. Y.

The Bridgeport Brass Company has shown excellent earnings in the past two and one-half years, and in the opinion of the board of directors this showing has been very largely due to the efforts of Mr. Day, according to a statement from the company.

William R. Webster, vice-president of the company, was elected chairman of the board of directors and will retain his title as vice-president. A vacancy in the board of directors was filled by the election of Mr. D. Swing Starring, president of the Wheeler Insulated Wire Company, Bridgeport.

The board, in addition to Mr. Starring and Mr. Day, consists of William R. Webster, Herman W. Steinkraus, Waldo C. Bryant, Edmund S. Wolfe, F. Donald Coster of Bridgeport; Burgoyne Hamilton of Southport; F. J. Kingsbury, Jr., of New Haven; Paul D. Hamilton and Rowley W. Phillips of Waterbury; F. Kingsbury Bull of Litchfield; George T. Wigmore of Naugatuck.

Institute of Chemists Medal Award

The medal of the American Institute of Chemists, awarded annually for noteworthy and outstanding service to the science of chemistry and the profession of chemist in America, was this year given to George Eastman, founder and head of the Eastman Kodak Company, Rochester, N. Y. In making the award, the Institute pointed out that Mr. Eastman, a pioneer in the chemistry of photography, had built up his great industry through constant chemical research, and that one of the first buildings erected at his "Kodak Park" plant was a chemical laboratory. In 1912, he erected an immense research laboratory—one of the largest in the world—in which photographic and general chemical research, including work in metals is being done. It is one of the greatest such institutions in the world. One of its chief contributions to the profession was the establishment in 1918 of a special department of synthetic organic chemistry, the primary object of which is to make the United States completely independent in regard to synthetic organic chemicals, which are of serious importance in research work.

Brass Ingot Statistics

The combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute, Chicago, Ill., for the month of April, 1930, amounted to a total of 6,041 tons.

On May 1st, unfilled orders for brass and bronze ingots and billets on the books of the members of the Institute amounted to a total of 8,773 net tons.

The average prices per pound received by its membership on commercial grades of the six principal mixtures of ingot brass during the twenty-eight day period ending April 25th, as follows:

Commercial 80-10-10 (1% impurities)	15.199c
Commercial 78% metal	13.139c
Commercial 81% metal	13.692c
Commercial 83% metal	13.739c
Commercial 85-5-5-5	13.317c
Commercial No. 1 yellow brass ingot	11.656c

Porcelain Enameled Ware Campaign

About sixty-five manufacturers of porcelain enameled stoves, refrigerators kitchen and bathroom wall tile, sinks, cooking utensils and signs met at the Cleveland Hotel, Cleveland, Ohio, on May 9th, for the purpose of discussing a co-operative national campaign for advertising and promoting the sale of porcelain

enameled products. The group was addressed by a number of advertising and industrial executives. A co-ordinating committee was appointed to work with the individual manufacturers, through their respective trade associations, in completing a proposed plan for a three-year co-operative effort. According to the plans, the campaign will be participated in not only by manufacturers of porcelain enamel stoves, refrigerators, and cooking utensils, etc., but also by the makers of raw chemicals and porcelain enamels for the trade. The co-ordinating committee includes W. A. Harshaw, president of the Harshaw Chemical Company, Cleveland, O., large manufacturers of electroplating supplies.

General Bronze Corporation

The General Bronze Corporation, New York, will issue $5,000,000 of 10-year 6 per cent convertible debenture bonds, authorized by stockholders last month. The proceeds will be used for plant expansion and improvement, acquisitions, etc.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

JUNE 2, 1930.

A new factory building to cost over $500,000 will be erected by the **American Brass Company** in this city very shortly. **President John A. Coe** of the American Brass Company last month confirmed reports that plans have been drawn and arrangements made to build it right away. It will be erected on the land of the former Holmes, Booth and Hayden factory, where some small and antiquated buildings were recently torn down.

In spite of denial by officials, reports are heard periodically that the **Scovill Manufacturing Company** is planning to build a factory building three stories high, 90 by 300 feet, for the manufacture of some of the lines now being made by **A. Schrader Sons, Inc.**, in Brooklyn, N. Y., which firm the local company acquired last winter. Officials of the Scovill Company declare there is nothing definite about any new building, that no bids have been called for, nor authorization for its erection given, but that informal estimates on the cost of a new factory building, the size of which they will not state, have been secured recently.

Charles E. Beardsley, principal founder of the **Beardsley and Wolcott Manufacturing Company,** has resigned as president and director and his resignation has been accepted by the directors. He is also the president of the **Bridgeport Brass Company.** The directors have chosen **R. W. Reid** of Providence, R. I., as vice-president and general manager, but have elected no one as president as yet. **Emil Mannweiler** of Naugatuck, vice-president and general manager of the **Eastern Malleable Iron Company,** has been elected a director of the company in place of Mr. Beardsley. Mr. Beardsley, who is said to be the largest stockholder of the company, intends to retain his stock and is said to be in entire accord with the changes that have been made. Some dissatisfaction has been shown among the stockholders recently with the company's financial standing. It passed its dividend the present quarter, for the first time since its organization. The officials state that moving of plants and consequent reorganization have been very expensive and have handicapped the operations of the company, causing reduced earnings. Mr. Reid has been general manager of the **Taft-Pearce Company** of Woonsocket, R. I. He will be in active charge of the operation and management of the local company, it is understood.

More than 695,059,000 pounds of brass, bronze and copper sheet, rod, tubing and finished and manufactured articles were turned out by the plants of the **American Brass Company** during 1929. This is exclusive of the wire mill products of the Kenosha branch, which has been consolidated with the **Anaconda Wire and Cable Company.** The total fabricated metal output of all the Anaconda subsidiaries was 1,050,054,045 pounds.

Suit has been instituted by the **Chase Brass and Copper Company** against the **Standard Manufacturing Company** of this city for $2,500 alleged to be due in payment for goods sold last year.

Brinton Carrigan, marketing councillor of the **Scovill Manufacturing Company,** spoke at the meeting of the state Chamber of Commerce in Hartford, May 21, on "Significant Trends in Marketing Analysis," illustrating his talk with charts showing the differences in the cost of distribution in different cities of the country.

Patents granted during the month to local inventors included the following: buckle by **Jerome R. LaVigne,** assigned to the **Waterbury Buckle Company;** lip stick holder, **Henry W. Wild,** assigned to the **Scovill Manufacturing Company;** chain portiere, **Serafino Grassi,** assigned to the **Naugatuck Chemical Company;** trunnion for barrels, **James R. Coe,** assigned to the **American Brass Company. Scovill Manufacturing Company,** has applied for a trade mark on dispensing boxes and cases.

The factory building of the former **Woolson Manufacturing Company,** Watertown, more recently owned by the **Federal Manufacturing Company,** was destroyed by fire last month. It has been idle since the latter company went into bankruptcy last year. The machinery was bought and removed by a New York concern some time ago.

W. R. B.

Connecticut Notes

JUNE 2, 1930.

BRIDGEPORT—The Whittlesey Manufacturing Company, makers of "Avro" airplanes, has acquired the capital stock of the **Taft Airplane Corporation,** Elizabeth City, N. C., builders of a flying boat called the "Kingfisher."

The Locomobile Company has appealed to the Superior Court from the valuation of $1,486,000 set on its property by the local assessors.

American Chain Company has declared its regular dividend of $1.75 a share on the preferred stock, payable June 30.

Federal Board of Appeals in Washington has turned down the appeal of the **Baird Machine Company,** Stratford, from taxes imposed in 1923. The board maintained that the company changed its method of filing its returns in 1922 without the consent of the Commissioner of Internal Revenue. The amount in controversy was $2,108.99.

Frederick B. Rentschler has retired as president of the **Sikorsky Aviation Company,** and has been succeeded by **E. E. Wilson,** president of the **Hamilton Standard Propeller Company.**

A patent was granted last month to **Gregory Brown,** assignor to the **Bridgeport Brass Company,** on a cluster stem.

NEW BRITAIN—Mortimer Nelson Judd, 65, grandson of Loren D. Judd, one of the founders of **North and Judd Company,** died here May 9 from a heart attack. Until his retirement in 1911 he was affiliated with the **North and Judd Company.**

Hardware from the P. and F. Corbin plant of the **American Hardware Corporation** will be used throughout the new **Empire State Trust Company** skyscraper in New York.

National Commander Bodenhamer of the American Legion, on his visit here last month, was presented with an elaborate water cooling set manufactured by **Landers, Frary and Clark** by **Vice-President H. R. Owen** of that company.

Stanley Works has been granted a foreclosure judgment to the amount of $96,607 by **Judge C. L. Avery** of the Superior Court against the **Commercial Aircraft Corporation of America, Inc.** Through this judgment the local concern will acquire the factory land and buildings of the other concern in Bridgeport.

MERIDEN—Frank Cushing, office manager of the **International Silver Company,** died at his home here April 29 from pneumonia and heart trouble.

International Silver Company has received the contract to supply the silverware for the new Waldorf Hotel in New York. The business involved amounts to approximately $155,000 and was keenly competed for by manufacturers throughout the country. The contract calls for delivery by October 1, 1931, and will be turned out on regular schedules.

International Silver Company has declared its regular quarterly common stock dividend of 1½ per cent payable June 1.

The local branch of the **New Departure Manufacturing Company** is resuming operations on a 54-hour week, an increase from 40 hours. The working force, which was curtailed several months ago, has gradually been increased and about 25 per cent of those laid off have been taken back.

BRISTOL—Earnings of the **Bristol Brass Company** for the first quarter of 1930 amounted to $93,000 after depreciation charges but before reserves for federal taxes and preferred dividends.

THOMASTON—Directors of the **Seth Thomas Clock Company** have declared the regular quarterly dividend of 37½ cents on the common and 43¾ cents on the preferred, both payable June 15. The company has reduced the working schedule from 36 to 30 hours per week. Previously the factories were operating on a four day, nine hour per day schedule and will now work 7½ hours daily for four days a week.

STAMFORD—The Yale & Towne Manufacturing Company reports net income of $130,422 or 27 cents a share on the 486,656 shares after depreciation and federal taxes for the first quarter of the year compared with $573,854 or $1.30 for the first quarter of 1929 on 440,000 shares.

TERRYVILLE—The shipping room of the **Eagle Lock Company,** which has been operating on a schedule of 55 hours, has had it reduced to eight hours a day, five and one-half days a week.

PLAINVILLE—Alfred C. Davis, president of **Marlin-Rockwell Corporation,** spoke on the policy of the corporation in regard to Plainville at the Chamber of Commerce meeting here last month. He said the company has found manufacturing costs, living conditions and labor conditions in Plainville superior to other places where it has plants. **Hency C. Washburn,** president of the **Plainville Casting Company,** and **F. T. Wheeler** of the **Trumbull Electric Manufacturing Company,** also spoke on the advantages the town possesses for their concerns.

HARTFORD—Earnings of the **Royal Typewriter Company** for the first quarter of the year amounted to $427,580 or $1.34 a share compared with $454,831 or $1.44 a share for the first quarter of 1929. W. R. B.

Providence, Rhode Island

JUNE 2, 1930.

The Manufacturers' Supply Company, 72 Elm Street, has notified the trade of the association of **Frank H. Fairbrother** with the concern as sales representative. Mr. Fairbrother has been identified for many years with the electroplating business.

The Orkin Jewelry Company has been incorporated under the laws of Rhode Island for the purpose of manufacturing and conducting a general jewelry business, with a capital stock of $10,000; the incorporators are **Arthur H. Feiner, William S. Orkin** and **Nellie M. Monahan.**

Forced to a change of location because of street improvements in the vicinity of the new Providence County Courthouse, the **Phillips Lead and Supply Company,** which has been for many years at 91 South Main Street, has removed to 231 South Main Street. This concern has two particular claims to distinction. During the 94 years of its existence the business has been conducted on South Main Street, where it was established in 1836 by **Thomas Phillips;** and during the whole period the control has remained in one family. **George E. Phillips,** who is now associated with **Herbert D. Nickerson** in its conduct, is the great-great-grandson of the founder. The new warehouse contains six floors with 65,000 square feet of area and will be entirely utilized by the firm. W. H. M.

Middle Atlantic States

Newark, New Jersey

JUNE 2, 1930.

The Westinghouse Electric and Manufacturing Company has leased from the **New York and Brooklyn Casket Company** about 3,500 square feet on the second floor of the building at Central Avenue and First Street. The space will be used as a radio laboratory for the testing of tubes and machines. The lease was for a term of years.

Positive Lock Washer Company, Avenue A, has let a contract for a 2-story brick and steel addition to cost $40,000. **General Alloy Company,** 188 New Jersey Railroad Avenue, will erect a brick and steel addition on Maple Place to cost $40,000. **Gergy Company, Inc.,** of Jersey City, will erect a 5-story, 50 by 100 foot factory building to cost $75,000.

Further addition to its land holdings in Belleville has been made by the **Wallace and Tiernan Company** in the purchase of vacant ground on Bayard Street. The purchasers will remove to this property, which measures 165 by 100 feet. The company now has control of the entire block and plans early addition to the factory structures for the production of chlorine and other chemicals.

The Antoxylin Chemical Corporation, New York, had purchased the plant of the **Raritan Rubber Company** in New Brunswick, N. J., and will manufacture special lubricants, oils, and a metal cleaner. The plant is 150 by 50 feet and comprises 8,000 square feet of floor space. It is surrounded by five acres of ground.

The following Newark concerns have been incorporated: **Lee Tanks, Inc.,** metal tanks, 2,500 shares common. **Elrad Products Company, Inc.,** manufacture electrical apparatus, $10,000. **Metal Window, Inc.,** manufacture metal window sashes, $100,000. **Jig and Die Boring Corporation,** boring jigs $100,000.

C. A. L.

Trenton, New Jersey

JUNE 2, 1930.

Trenton metal manufacturers are not at all pleased with the business outlook at this time, but are hopeful that conditions will improve. The big plant of the **Jordan L. Mott Company** is operating but a few days a week in the various departments and the number of employes is less than half of the number a few years ago. Some workmen can make but two or three days a week.

Mineral production in New Jersey for 1928 was 3.4 per cent less than the figure for the preceding year, according to Assistant State Geologist Meredith E. Johnson. The report is based on statistics gathered by the State Department of Conversation and Development and the United States Department of Commerce. Johnson declared that some industries suffered while others profited.

Siegfried Roebling, vice-president of the **John A. Roebling's Sons Company,** has been on a long business trip to Seattle, Portland, San Francisco and other points along the Pacific Coast. Mr. Roebling was accompanied by his wife.

John A. Roebling's Sons Company has let a contract to Hoggson Brothers, of New York, for additions to the plant on South Broad Street. The improvements will cost $123,000.

William E. Meginnes and **William A. Welsh** have been appointed receivers for the **Hobson Flatware Company,** Inc., Lambertville, N. J., by Federal Judge Avis. The action was at the request of Joseph N. Hazen, Andrew Foltz and Louis C. Williams, of Lambertville, creditors of the firm. Hazen claims that the sum of $2,920.90 is due him for printing, and in addition he holds a promissory note for $1,500. Foltz is the holder of a note for $1,500 and Williams has one for $3,800. The petition states that the assets of the company are valued at $385,000 and that liabilities total $239,000. F. J. **McCarthy** is listed as chairman of the firm, and **S. T. Alleva** is secretary. C. A. L.

Middle Western States

Detroit, Michigan

JUNE 2, 1930.

Industrial conditions in this area have not advanced as rapidly as had been expected earlier in the season. Production, particularly in the non-ferrous field, is decidedly backward, and in general is following the trend of other lines. Much as industrial leaders hesitate to admit it, there is no getting around the fact that business conditions are disappointing. None of the big plants are producing more than is immediately demanded. And it looks now as if this will be the rule throughout the summer and fall.

The plating industry naturally is affected in the same way as the metal plants. While most of the plating plants are operating, none of them are producing to capacity.

Manufacturing jewelers are having a decidedly quiet time. This branch of the metal industry has been struggling since the first of the year.

Papers have been filed at Lansing for the incorporation of the **National Time and Signal Company**, a new industry which will locate in Detroit. This concern is coming to Detroit through efforts of **R. S. Fulton**, vice-president of the **Time System Company** and his associates. It marks the merger of sales and manufacturing facilities of several existing companies now engaged in the electrical industry. These are the **Lake Manufacturing Company**, California, makers of bells and horns; **Chicago Signal Company**; **Reliance Signal** and **Time Systems Company.**

Orders to release 430,000 valves for the **Chrysler Motor Corporation**, applying on a blanket contract, were received recently by **Thompson Products, Inc.**, according to an announcement. Shipments are being made from the Cleveland plant.

General Chromium Corporation, 3220 Bellevue Avenue, is one of the favored concerns in Detroit these days. This seems to be due to some extent to the impetus given to tin plating recently by the refrigeration industry. Practically all refrigeration manufacturers now specify tin plating of parts used in the assembly of their machines. This is especially true of coils and other internal parts, because of the high resistence of tin to corrosion when applied to copper or brass.

May production of **Copeland Products, Inc.**, refrigeration manufacturers, is expected to break all records, according to **Louis Ruthenburg**, president. This follows the new high mark set in April, when sales were 142 per cent of those in April, 1929.

Installation of an automatic enamelling and lacquering department has recently been completed at the Detroit plant of **Thompson Products, Inc.** It is of the conveyor spray type and will make possible a considerable cut in labor costs.

Enlargement of the **Mueller Brass Company's** plant at Port Huron, Mich., is seen as the result of the recent settlement of the suit brought by the Mueller company against **Charles A. Hill**, its former chief engineer, to restrain him from disposing of patent rights to a pipe fitting which he invented, according to recent reports. It was announced at the time of the settlement that Mr. Hill would return to the company and devote considerable of his time to the introduction of the new product on the market.

Business of the **Warner Aircraft Corporation** is expected to be increased this year as a result of orders received from the **Consolidated Aircraft Company** of Buffalo.

F. J. H.

Cleveland, Ohio

JUNE 2, 1930.

Definite improvement in the business situation is seen by the **Union Trust Company.** In its recent survey of trade the bank reports increases in automobile production, together with some indication of improvement in employment. Further gains are forecast, to come as the season advances. On the other hand, the bank points out that actual records for the first quarter of the year indicate not only the substantial nature of the industrial slump, but indicate that its effects have as yet by no means been overcome.

Symptoms of betterment in business in the Cleveland area are noted by Col. Leonard P. Ayres, vice-president of the Cleveland Trust Company, although he adds there is not much actual statistical evidence of improvement in the situation.

At the recent annual meeting of stockholders of the **White Motor Company** in Cleveland, **Robert W. Woodruff**, president, stated the sale of motor trucks does not appear to have been affected by the slackened pace of the past few months to the same extent as other branches of industry. During the first quarter of 1930, sales of his company were only approximately 10 per cent less than for the same period of last year.

Directors of the **Willys-Overland Company**, Toledo, have voted to omit the common dividend due at this time, but have declared the quarterly payment of $1.75 a share on the preferred.

F. J. H.

Wisconsin Notes

JUNE 2, 1930.

R. J. Klug of the **National Enamelling and Stamping Company**, Milwaukee, was recently named president of the Layton Park Civic Association.

The Milwaukee Metal Manufacturing Company, Milwaukee, suffered a fire loss when the building occupied by the firm was attacked by flames. Damage to the three-story brick structure, located in downtown Milwaukee, was estimated at $150,000.

Leo Sorenson, credit manager for the **Sunlite Company**, Milwaukee aluminum ware manufacturers, was one of the delegates to attend the national convention of credit executives held in Dallas, Tex., May 12 to 16.

The business of the **Standard Brass Works**, Milwaukee, has increased 700 per cent in the last 14 years, according to **Roy Jacobs**, president and treasurer of the company. The company employs 40 men and makes brass pipe fittings, valves and brass machine parts. The company has its own furnaces, foundry and machine shop. Officers of the concern in addition to Mr. Jacobs are **Burleigh Jacobs**, secretary, and **Adolph Schott**, vice-president.

Badger Die Casting Company is now occupying its new and larger quarters on Clinton Street in Milwaukee. The company is turning out large babbitt beams for refrigerators to be used by the **Vilter Manufacturing Company**; 30,000 aluminum table shoes for the **Kewanee Manufacturing Company**; and aluminum parts for the **Teleoptic Company**, Racine, Wis. **George W. Tuchel**, president, and **Charles Strassmann**, secretary, started the **Badger Die Casting Company** 11 years ago. Owing to rapid expansion the company recently moved into larger quarters where their jobbing orders can be better handled.

A. P. N.

Other Countries

Birmingham, England

MAY 19, 1930.

The non-ferrous metal markets are dull, owing to the fluctuations in copper. At the beginning of the month strong copper fell £18 a ton and in another week it was down again by £5. Copper tubes and brass tubes have been reduced accordingly. Thus far there has been little response as far as buying is concerned, but brass founders are mostly short of work and are unable to place anything in the nature of sub-

stantial business. It is believed that a good deal of trade would come out if copper could be stabilized at a reasonable figure.

Makers of brass water fittings in the Birmingham area are experiencing a dull period. Their export markets are affected by tariffs, particularly in Australia, which recently increased its tariff against British goods. Amongst some manufacturers it is believed that Australia will reconsider its decision in regard to this matter and they are hoping that some relief will be granted. **Building operations** have been held up and this has curtailed the demand for brass water fittings at home. In regard to the working of the **Merchandise Marks Act,** it is believed that this has had a salutary effect as water fittings now have to be marked with the word 'Foreign." There is still a good deal of competition from the Continent in cabinet brass foundry and the same competition, especially from Germany and Italy, is encountered in the Near East, such as Palestine, Malta and, further afield, Burma.

The annual general meeting of the **British Aluminium Hollow-Ware Manufacturers Association** was held in Birmingham on May 1. The chairman, **W. H. Bulpitt,** of the firm of **Bulpitt and Sons, Ltd.,** Birmingham, was re-elected chairman for another year. **Eric Sellman,** of **Sellman and Hill** of Wolverhampton, was made vice-chairman. The report of the executive committee submitted to the meeting referred to several important matters, including standardization and simplification of aluminium utensils, Australian tariffs, British Engineering Standards Association (Draft specification for pure aluminium sheet and strip); and specification for aluminium cooking utensils (H. M. Government Co-Ordinating Sub-committee).

Multi-colored gold of nearly all the colors of the rainbow is the latest fashion in matters of jewelry, and in the **Birmingham City Art Gallery** there are now on exhibition examples of the most recent developments of this kind, which also shows how local manufacturers are in a position to compete successfully with other countries. This collection was sent by the **Birmingham Jewellers' and Silversmiths' Association.** It includes flexible bracelets made up of very fine gold wire, woven in transverse bands of different colors, whilst others are stiff with the color in longitudinal stripes with delicate surfaces which look like watered silk. There are also cigarette cases with bands of gold of two or three colors, chains with alternate sections of various tints, rings with inlaid design in contrasting shades, bird brooches with plumage in colors, and a rainbow and chessboard. Each side of the rainbow is composed of fine strips of gold of which the innermost is blue nine karat, the next being of green 18 karat, which is succeeded by yellow 22 karat, and two outer bands of 9 karat of different shades. The mixing together of the different metals is effected by melting them together, the resulting mixture being cast into an iron mold and the bar so produced is rolled out or drawn into wire as required. In the chessboard the squares are of different karat while the chessmen are of silver, one set being oxidized. J. A. H.

Business Items—Verified

Leeds and Northrup Company, Philadelphia, Pa., has changed the address of its Cleveland, Ohio, office to 1941 Union Trust Building.

Charles Pack, consulting engineer, specializing in die casting practice, has removed his offices to 60 East 42nd Street, New York. New telephone number is Vanderbilt 6642.

The Harshaw Chemical Company of New York, Inc., has moved its offices to the Chrysler Building, 405 Lexington Avenue, New York. The new telephone number is Vanderbilt 1914.

Model Brass Foundry, 232 East Decatur Street, Decatur, Ill., has completed a new furnace room 45 by 20 feet, and has also installed sandblast equipment. Company casts brass, bronze and aluminum.

Federal Mogul Corporation, Detroit, Mich., bronze bearings manufacturers, have entered a Metropolitan group insurance plan for protection of its more than 400 employees. Company and employees share the costs.

Hobson Plateware Company, Inc., Lambertville, N. J., manufacturers of plated flatware in silver, nickel and chromium, is now being operated by **William A. Welsh** and **William E. Meginnes,** receivers appointed by Federal Court.

Decker Screw Products Company, Albion, Mich., has expanded its plant. Included is installation of a new cadmium plating department which occupies most of a new one-story addition. New divisions are already in operation.

T. E. Conklin Brass and Copper Company, Inc., New York City, metal distributors, has entered into a group insurance plan under which it co-operates in payment for life, health and non-occupational insurance for its employees.

Charles A. Branston, Inc., has leased space in building at Ellicott and Mohawk Streets, Buffalo, N. Y., where it will carry on its manufacture of medical and surgical electrical appliances, after increased space is equipped with new equipment.

The Brown Instrument Company, Philadelphia, Pa., announces the consolidation of its Chicago sales office and midwestern factory branch in new quarters at 155 East Superior Street, Chicago. Practically double the former space has been provided.

Wabash Sanitary Company, Wabash, Ind., has merged with **Louisville Enameled Products Company,** Louisville, Ky. The new company is managed by **P. B. McBride,** formerly with the **Ferro Enamel Supply Company,** Cleveland, Ohio, and **Richard L. Snidham,** of the Wabash Company.

Singmaster and Breyer, 420 Lexington Avenue, New York, have found it necessary to add telephone lines to take care of its increasing business in production and research chemical and metallurgical engineering, reports, plant design and management. New numbers are Lexington 7444, 7445, 7446.

Union Metal Manufacturing Company, 1432 Maple Avenue, N. E., Canton, Ohio, will remodel its plant. One-story addition to cost $20,000 is planned, in which special machinery will be installed. Company makes poles for street lighting and trolley use; operates brass foundry, tool room, casting shop.

Federal Brass and Manufacturing Company, Marysville, Ohio, sustained damage of $250,000 to its plant when fire completely destroyed its foundry building and other units except its offices, on May 5. Insurance coverage is stated to have been only about $100,000. Company has not decided anything as to relocation.

Milwaukee Die Casting Company, 291 Fourth Street, Milwaukee, Wis., has purchased a site 380 by 470 feet on Holton Street, that city, but plans no plant expansion at this time. **H. F. Schroeder** is vice-president of the company, which has a foundry for producing bronze, aluminum, etc., a brass machine shop, tool room, casting shop, die casting rooms, etc.

Reynolds Metals Company, Louisville, Ky., has purchased the assets of the **Midland Metals Company,** 1259 South Campbell Avenue, Chicago, Ill., tinfoil manufacturer. The companies will be consolidated and operations continued at the Chicago plant, under name of **Midland Tinfoil Company,** according to **H. F. Hagedorn,** treasurer of the Reynolds company.

Kocour Company has been adopted as the new name for the State Manufacturing Company, 4724 South Turner Avenue, Chicago, Ill., manufacturers of electroplaters' and polishers' supplies and equipment, control instruments, etc. The new name, according to **C. Kocour,** head of the firm, has been decided upon in order to indicate the responsibility behind the company. Mr. Kocour also states that the company's main line of business is in buffing compositions. He points this out because many people apparently believe that the company is largely a producer of testing instruments.

Review of the Wrought Metal Business

By J. J. WHITEHEAD

President of the Whitehead Metal Products Co. of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

JUNE 1, 1930.

Since last month the copper industry has been through one of the greatest buying periods in its history. The price of the metal did not hold at 14c but declined to 12½c or even 12¼c, but now seems to be pretty well established at 13c. The stocks of refined copper, according to figures released about May 12th, were about 301,000 tons on May 1st. It has been estimated that at least 250,000 tons were sold during the two weeks of buying, so that the stocks at the end of May, allowing for current production, should be between 100,000 and 150,000 tons.

Consumers of fabricated products came into the market for unusually large lots, especially while the lower prices for the metal prevailed. A tremendous volume of business was transacted in a relatively short while, and now, towards the end of the month, it has slowed down. This was to be expected.

From now on, more so than previous to this buying wave, the demand for copper and copper products will follow more closely the general business trend. It is significant that in the first quarter of 1930 the demand for copper for electrical manufactures was 53,000 tons as compared to 52,000 tons in 1929. However, the demand for copper in the automobile industry is down 33% from 1929, and its use for buildings is down about 25%. At the present time it is believed that during the early part of June, demand for copper and copper products will be rather quiet because of the large tonnages purchased by users during May. If, however, general business activity should show more definite signs of revival, it is hardly to be supposed that the price of copper, and, of course, products fabricated from it, will sell for very much below the 13c base. Secretary of Commerce Lamont has stated that business will be normal by July. If this occurs, certainly the increased activity will be reflected in the demand and possibly the prices for copper and its products.

It is believed that where commodities have reached the cost of production and no distress amounts of the products are overhanging the market, it is reasonable to suppose that the price of that commodity will not seriously decline from the level reached. Apparently in the case of copper the large excess stocks of material have been taken out of the hands of the producer and this part of the industry it therefore in a much better condition that it was. Presumably this copper was purchased for early use and has therefore gone into consumption.

In spite of the curtailment of business generally, the demand for nickel and Monel products has not suffered. New uses for these products has probably created a demand that has taken up any slack that may have occurred due to curtailment of existing markets.

The demand for aluminum is keeping up and these products are being consumed at a rate but slightly below normal.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

COPPER

JUNE 1, 1930.

Special market activity characterized the movements in copper during May. At the beginning of month the trading basis was at the 14 cent level, but buying was restricted at that price owing to expectations of a further decline. It was evident that further concessions were necessary to attract buyers, and move the huge surplus more rapidly. The stimulus was soon applied to the situation when offerings came out at 13 cents, and later at 12½ cents. During the uncertainty and unsettlement that prevailed the low point of 12 cents was touched for a limited tonnage.

Large scale buying was greatly accelerated at the 12½ cent level for Connecticut delivery and 12.80 cents c.i.f. European ports. Tremendous quantities were absorbed by domestic and foreign consumers at these prices. Total sales during the past month were at an unprecedented rate in the history of the copper industry. Undoubtedly there will be a significant change in the statistical position during the balance of the year. It ought to be easy to detect signs of definite business revival and market improvement in the coming months.

Obviously, a readjustment of supply to demand and a drastic reduction of surplus stocks will ultimately place copper in a sound position. The present price is uncomfortably and unreasonably low. There are many reasons for believing that the recent enormous shrinkage in values cannot long continue in view of the industrial progress of the world. Evidently consumers at home and abroad came to the conclusion that the bottom of the market was reached last month. There was an avalanche of orders from all quarters, and the pent up demand was equal to approximately every pound of refined copper in stock. Total sales for the month of May, export and domestic, are estimated at over 600,000,000 pounds, a record-breaking achievement during a like period of time.

ZINC

Adverse conditions have continued in zinc, and prices have sagged to 4.65c East St. Louis and 4.97½c to 5c New York. Demand has been on a moderate scale, but not brisk enough to change the trend of the market for the better. Additional data available lately showed an increase in smelters' stocks of 2,420 tons. The surplus tonnage in primary hands on May 1 amounted to 96,453 tons. This compared with 34,588 tons a year previous. Obviously this explains why the selling price is unable to register a satisfactory increase. Output needs to be brought into equilibrium with demand. Zinc ore declined $2 per ton to $33, the lowest price in years. Consumers have been holding their purchases down to a hand-to-mouth basis in view of the large supplies available. This policy would undoubtedly change on evidence of more drastic plans of reduction in output by important producers.

TIN

The outstanding developments in the tin situation have been the large increase in stocks as reported May 1, and the recent depressed and downward trend of the market. Substantial price declines have resulted from present unfavorable conditions and trading much of the time lately was light due to the pessimistic feeling both here and abroad. Total visible supply of tin on May 1 amounted to 36,595 tons as compared with 32,972 tons on April 1, and 26,353 tons a year ago. The heavy supplies have impaired the technical position of world market for tin. Conditions have remained unusually sensitive to the growth of expanding supplies, and during the last half of May prices were the lowest since 1922. Straits tin sold down to 31¼c for June delivery. The high price for the month on spot Straits was 33¼c. There were periods of considerable market activity, but trading was quiet much of the time lately. Greater curtailment of output and a pronounced reduction in warehouse supplies appears to be necessary to thoroughly improve the tin situation.

LEAD

A heavy buying movement developed in the lead market last month that put real life into the situation. The buying wave assumed the largest proportions in months. Demand came from many sources and seemed to have been stimulated by the great activity in copper. Later in the month, however, demand slackened and the price was reduced from 5.60c to 5.50c New York basis. There was some shading of this equivalent in the St. Louis market, but the situation appears abundantly able to facilitate a good outlet for the metal at present prices. Cable makers have been specially active purchasers. Consumption is on a large scale with an upward trend in some branches of trade. Stocks of lead in the United States on May 1 were reported at 42,015 tons, a decrease of about 450 tons, compared with April 1, and a decrease of over 9,000 tons compared with January 1.

ALUMINUM

The American position of aluminum presents no new feature of special interest. There is a continuation of the same prices month after month by the leading interests. Consuming demand is absorbing good regular shipments, but there is room for improvement in this respect. It is interesting to note that England, Russia and Japan are all planning increased facilities and up-to-date plants for the production of aluminum on a large scale. New uses for aluminum are being widely developed both in this country and Europe, in addition to the large tonnage absorbed by the automobile, aircraft, railroad and shipbuilding industries. Another outlet is being developed in connection with architecture, ornamentation and articles of furniture.

ANTIMONY

There were occasional displays of buying interst for moderate shipments of antimony, but there were no important developments to claim special attention. Recent trading was quiet and there was no sustained activity to improve the general tone of the market. Prices during May ranged between 7.40c and 7.60c duty paid, with the low quotation prevailing at the close. The import price for Chinese regulus was quoted at 5.40c. c.i.f. New York, but such offers have not aroused much interest among either consumers or dealers. Total shipments from China to the United States for the first four months of this year are reported at 2,401 tons as compared with 3,395 tons in the same period of 1929. Chinese output for April was estimated at about 1,400 tons as against 1,300 tons in March.

QUICKSILVER

Demand for quicksilver has improved lately and a substantial volume of business is reported. Market is decidely firmer and quotes $118 to $119 a flask. Foreign production has been greatly curtailed, and Spanish factors are said to have suspended output.

PLATINUM

Trade interest is not particularly pronounced and the refined metal is quoted at $44 to $45 per ounce. There are reports of large accumulations in Russia. New sources of supply are also coming into the field, and these features have had a depressing influence on market prospects.

SILVER

The silver bullion market has been moving by successive stages to extremely low levels. Prices have sagged in sympathy with unfavorable conditions in China and India. Within a short time Chinese operators were heavy sellers. Supplies held in that country are very large, and it is not strange that demand from the Far East is much below normal. Purchases for India are not important enough to give support to a drooping market. The high rate of production has also put a decided strain upon the situation. There have been many detrimental factors to market values, and it looks as if it would require considerable time and effort to restore a brighter outlook for this metal. Stocks of silver in Shanghai were recently reported at 240,678,000 ounces, against 192,388,000 ounces on January 1, 1930. Combined stocks in India and China a short time ago amounted to 618,906,000 ounces, an increase of 55,096,000 ounces since the beginning of this year. New York price of silver is quoted at 40½ cents an ounce.

OLD METALS

Transactions in secondary metals reflected a great degree of caution among both dometic buyers and exporters. The recent downward tendencies in primary markets caused substantial price shifting in scrap grades. Considerable activity, however, occurred in copper and brass. The situation was more or less unsettled at times, and both buyers and sellers were inclined to restrict operations pending further developments. Domestic dealers quote buying prices at 10½c to 10¾c for high grade copper, 8¾c to 9c for light copper, 5½c to 5¾c for heavy brass, 7½c to 7¾c for new brass clippings, 3¾c to 4c for heavy lead, 2c old zinc, and 13½c to 14c for aluminum clippings.

Daily Metal Prices for the Month of May, 1930

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	5	6	7	8	9	12	13	14	15	16
Copper c/lb. Duty Free												
Lake (Del.)	14.00	14.00	13.00	12.25	12.50	12.50	12.50	13.00	13.00	13.00	13.00	13.00
Electrolytic (f. a. s. N. Y.)	13.50	13.50	13.00	12.25	12.50	12.75	12.75	13.00	13.00	13.00	13.00	13.00
Casting (f. o. b. refinery)	13.00	12.75	12.50	11.75	11.75	11.75	12.20	12.75	12.75	12.75	12.75	12.75
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	4.70	4.70	4.70	4.70	4.65	4.65	4.65	4.60	4.60	4.65	4.65	4.65
Brass Special	4.80	4.80	4.80	4.75	4.75	4.75	4.70	4.70	4.70	4.70	4.70	4.70
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	33.25	33.25	32.45	32.10	32.375	32.25	31.80	32.50	33.00	33.125	32.375	32.00
Pig 99%	32.50	32.50	31.75	31.75	21.625	31.50	31.10	31.75	32.25	32.375	31.625	31.25
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.45	5.45	5.45	5.45
Aluminum c/lb. Duty 5c/lb	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.60	7.60	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50	7.50
Silver c/oz. Troy Duty Free	42.25	42.125	42.50	42.25	42.00	42.25	41.875	41.625	41.125	41.125	40.75	41.125
Platinum $/oz. Troy Duty Free	43.00	43.00	43.00	43.00	43.00	43.00	43.00	43.00	45.00	45.00	45.00	45.00

	19	20	21	22	23	26	27	28	29	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	14.00	12.25	12.988
Electrolytic (f. a. s. N. Y.)	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.50	12.25	12.964
Casting (f. o. b. refinery)	12.625	12.625	12.625	12.625	12.625	12.625	12.625	12.625	12.625	13.00	11.75	12.527
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	4.625	4.65	4.65	4.625	4.65	4.65	4.65	4.65	4.65	4.70	4.60	4.652
Brass Special	4.675	4.70	4.70	4.675	4.70	4.70	4.70	4.70	4.70	4.80	4.675	4.719
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	31.75	31.50	32.10	31.65	31.375	31.70	31.70	31.25	31.25	33.25	31.25	32.131
Pig 99%	31.00	30.75	31.35	30.90	30.625	31.00	31.00	30.50	30.50	32.50	30.50	31.392
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	5.45	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.45	5.40	5.412
Aluminum c/lb. Duty 5c/lb	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	7.45	7.40	7.40	7.375	7.375	7.35	7.35	7.30	7.30	7.60	7.30	7.452
Silver c/oz. Troy Duty Free	40.625	40.25	40.125	40.125	40.50	39.25	39.25	38.75	37.25	42.50	37.25	40.815
Platinum $/oz. Troy Duty Free	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00	43.00	44.238

Metal Prices, June 2, 1930

NEW METALS

Copper: Lake, 13.00. Electrolytic, 13.00. Casting, 12.625.
Zinc: Prime Western, 4.65. Brass Special, 4.70.
Tin: Straits, 30.75. Pig, 99%, 30.00.
Lead: 5.40. **Aluminum,** 24.30. **Antimony,** 7.25.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $120.00. **Bismuth,** $1.00.
Cadmium, 70. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 36.375.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $45.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	9¼to11
Brass Ingots, Red	11¼to13
Bronze Ingots	12¼to14½
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	22 to37
Manganese Bronze Ingots	10½to15
Manganese Bronze Forgings	35 to43
Manganese Copper, 30%	23 to30
Monel Metal Shot	28 to35
Monel Metal Blocks	28 to35
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	14 to16
Phosphor Copper, guaranteed 15%	18 to20
Phosphor Copper, guaranteed 10%	17 to19
Phosphor Tin, no guarantee	42 to50
Silicon Copper, 10%, according to quantity	25 to35

OLD METALS

Buying Prices		Selling Prices
11.00to11.25	Strictly Crucible Copper	12.00to12.25
10.25to10.75	Heavy Copper and Wire	11.25to11.75
9.75to10.00	Light Copper	10.75to11.00
6.50to 6.75	Heavy Brass	7.50to 7.75
5.50to 5.75	Light Brass	6.50to 6.75
8.75to 9.00	No. 1 Composition	9.75to10.00
8.00to 8.25	New Composition Turnings	9.00to 9.25
4.00	Heavy Lead	5.00
2.00to 2.25	Old Zinc	3.00to 3.25
3.00to 3.25	New Zinc Clips	4.00to 4.25
14.25to14.50	Aluminum Clips (new)	18.00to19.00
8.75to 9.25	Scrap Aluminum, cast alloyed	12.00to14.00
10.25to10.50	Scrap Aluminum sheet (old)	12.00to13.00
24to26	No. 1 Pewter	20to30
20to21	Old Nickel Anodes	22to23
15to23	Old Nickel	17to25

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled).....22¾c. to 23¾c. net base
Front Stock .....23¾c. to 24¾c. net base

BARE COPPER WIRE

14⅝c. to 14¾c. net base, in carload lots.

COPPER SEAMLESS TUBING

25c. to 26c. net base.

SOLDERING COPPERS

300 lbs. and over in one order.....21¼c. net base
100 lbs. to 300 lbs. in one order.....21¾c. net base

ZINC SHEET

Duty on sheet, 2c. per lb.	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 7 per cent discount	Net Base 10.00
Casks, jobbers' price	10.25
Open casks, jobbers' price	11.00 to 11.25

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base, ton lots, per lb. 33.30
Aluminum coils, 24 ga., base price..... ..... 31.00

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over N. Y. Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 38.375c. per ounce Troy upward, according to quantity.

BRASS MATERIAL—MILL SHIPMENTS

In effect May 13, 1930
To customers who buy 5,000 lbs. or more in one order

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.19¾	$0.21⅛	$0.22⅛
Wire	.20¼	.21⅝	.22⅝
Rod	.18	.21⅝	.22⅝
Brazed tubing	.27¼	....	.31⅝
Open seam tubing	.27¾	....	.29⅞
Angles and channels	.27¾	....	.29⅞

BRASS SEAMLESS TUBING

24¾c. to 25¾c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	22⅜c. net base
Muntz or Yellow Metal Sheathing (14"x48")	21¾c. net base
Muntz or Yellow Rectangular sheet other sheathing	21¾c. net base
Muntz or Yellow Metal Rod	19c. net base

Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	27½c.	10% Quality	30½c.
15% Quality	29¼c.	15% Quality	34¼c.
18% Quality	30¾c.	18% Quality	37¼c.

MONEL METAL, SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

Supply Prices, June 2, 1930

ANODES

Copper: Cast	25⅜c. per lb.	**Nickel:** 90-92%	45c. per lb.
Rolled, oval	23c. per lb.	95-97%	47c. per lb.
Rolled, sheets, trimmed	21¼c. per lb.	99%	49c. per lb.
Brass: Cast	24⅜c. per lb.	**Silver:** Rolled silver anodes .999 fine are quoted from 42¼c., Troy ounce, upward, depending upon quantity.	
Zinc: Cast	12 c. per lb.		

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & Over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Opens buffs, per 100 sections.

11" 20 ply 64/68 Unbleached	$20.94 to 26.85
14" 20 ply 64/68 Unbleached	31.09 to 39.86
11" 20 ply 80/92 Unbleached	24.39 to 31.27
14" 20 ply 80/92 Unbleached	35.94 to 46.07
11" 20 ply 84/92 Unbleached	33.77 to 45.11
14" 20 ply 84/92 Unbleached	50.20 to 66.93
11" 20 ply 80/84 Unbleached	31.38 to 40.23
14" 20 ply 80/84 Unbleached	46.53 to 59.64
Sewed Pieced Buffs, per lb., bleached	33c. to 79c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11-.18
Acid—Boric (Boracic) Crystals	lb.	.08½
Chromic, 75 to 400 lb. drums	lb.	.18-.21
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.16¾-.21¼
Denatured, drums	gal.	.42-60
Alum—Lump, barrels	lb.	.0325
Powdered, barrels	lb.	.039
Ammonium chloride, solution in carboys	lb.	.06½
Ammonium—sulphate, tech., bbls	lb.	3.3
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.25
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.20½
Cyanide (100 lb. kgs)	lb.	.45
Sulphate, bbls.	lb.	5.2
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.35
Chloride, bbls.	lb.	.20
Salts, single, 300 lb. bbls.	lb.	.12½-.13
Salts, double, 425 lb. bbls.	lb.	.12½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.093
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.06¼-.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	.35-.37½
Cyanide (fluctuating)	oz.	.44-.47
Nitrate, 100 ounce lots	oz.	.30¼-.32¼
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.17
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¾
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.32½-.42½
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.32
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½